Social cost of illicit drug use and policy justification

The case of Iceland and supply-side policy

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Submitted: May 2015

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Master's thesis for the Master of Philosophy in Economics

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May 2015

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http://www.duo.uio.no/

Printing: Reprosentralen, University of Oslo

Abstract

Illicit drugs and drug abuse are one of the most prevailing socio-economic issues in modern societies. The social cost that dependent users cause themselves and others in society can be massive. This problem is particularly hard to deal with and no comprehensive solution exists. Responding to the drug problem through public policy interventions has still been a priority in many societies. According to economic theory such interventions can only be justified based on the individual drug user not taking into account all the cost connected to his decision, which causes unintended or unrealized effects. From a behavioural economic perspective public policy intervention can help prevent decision failure that is causing an undesired self-harm to the user. From a more traditional economic perspective the only policy justification is based on externalities or the harm inflicted upon others by the consumption decision of the drug user. Both arguments are considered relevant in the case of Iceland. To support the discussion on policy justification and the implication for supply-side policy the average social cost of illicit drug use per year is estimated. Even though drug abuse is not relatively widespread in Iceland the average social cost the society is faced with each year seems considerable. General negativity towards illicit drugs has probably hindered further expansion of the drug market. Furthermore, the tough supply-side enforcement in Iceland has possibly prevented heroin (which is very costly to society) from gaining foothold in the economy.

Table of contents

List of tables

List of figures

1 Introduction

Drug abuse is a global phenomenon and many of its causes and results are universal. According to the global estimates of UNODC (United Nations Office on Drugs and Crime) approximately 5,2% of adults have used drugs in the last year, and around 11% of those individuals have dependency problems (UNODC, 2014). In spite of some common factors, the core of the drug problem varies between different nations. Drug abuse can harm domestic public health and safety through a variety of channels. For some societies the most harm is generated by the actual drug consumption while for others it is the drug trafficking or some other aspects of the problem (Babor, Caulkins et al., 2010; Babor, Room and Strang, 2010).

Many believe illicit drug abuse to be the most serious social problem in modern societies, and drug abuse is most likely connected to other complex social problems. (Babor, Caulkins et al., 2010; Babor, Room et al., 2010). Based on this connection, and the complexity of the problem, drug treatment is often insufficient to deal with the addiction. The social background of addicts can induce abuse of hard drugs and criminal activity as a coping mechanism for their misery and lack of hope (Gunnlaugsson, 2002). Furthermore, the drug abuse can also be the cause of social problems or create more for those already suffering. Drugs and illicit drug use is therefore a prevailing socio-economic issue. A comprehensive solution to the problem does not exist and this issue is particularly hard to deal with. Therefore, many drug policies are inefficient which causes more waste of resources than necessary and perhaps extra harm to the drug users. Furthermore, drug policy is a complex and political field and therefore, if it actually existed, the implementation of an "efficient" drug policy might not even work (Babor, Room et al., 2010; Moore, 2007).

Responding to the drug problem has been a high priority in the public policy of many countries. In spite of great efforts in drug enforcement illicit drugs seem to be firmly established in most societies. Research have shown that most who try or use drugs do not become dependent or develop drug-related problems. Many drug consumer use these substances similarly as non-addicted people use alcohol. However, there are always some who abuse these substances (Babor, Caulkins et al., 2010; Babor, Room et al., 2010; Gunnlaugsson, 2002, 2013). The harm dependent users cause themselves and society in general can be massive and that is surely a problem that is worthy of further analysis. In this thesis the social cost of drug abuse will be considered with respect to public policy

intervention. Economic justification for such interference is based on preventing cost not taken into account by the decision maker, whether it is private or external cost. Therefore, the private cost of financing the drug use is not relevant in this discussion as this cost is actually taken into account by the addicts. Perhaps it is even the only cost they do realize in their decision making.

Drug abuse causes significant cost in several sectors of society. Firstly, drug abuse harms the actual drug users, for example in the form of reduced life quality and increased mortality for addicts. Reduced health as a result of drug use is both connected to physical and mental conditions. Examples of physical harm connected to drug use are cardiovascular diseases, lung diseases, various physical pain, death as a result of overdose, and infectious diseases such as hepatitis B and C and HIV. Examples of the mental harm often resulting from drug abuse are mental disorders such as personality disorders and depression. Secondly, drug use has negative impact on third parties and society as whole in the form of externalities. Society is burdened with costs such as cost of treatment, drug-related health care and social services, cost of police, judiciary, customs and prevention, as well as burglary, violence and traffic accidents caused by drug abusers.

The focus in this thesis is primarily on illicit drugs, the social cost they generate, and the implication for policy justification. Therefore, unless stated otherwise, drugs refer to illicit drugs or substances. In this thesis the theoretical economic arguments for policy justification will be discussed, both based on the harm inflicted upon others (external costs) and self-harm (private cost). To enrich the discussion on policy implication it is important to have rough estimates of the social cost generated by illicit drug consumption each year. This cost will be estimated for the case of Iceland in order to support the discussion of this thesis. Furthermore, supply-side policy has been a dominant strategy used to respond to the drug problem in Iceland and therefore it will give further insights to discuss it separately. However, as discussed in this thesis, it is not straightforward to estimate the benefits of drug control due to causal uncertainties. Even though it is possible to account for various uncertainties in social cost estimates connected to drug abuse, it is not as straightforward to estimate the benefits of drug control.

2 The drug problem and the Icelandic context

Drug abuse is a global phenomenon and many of its causes and results are universal. However, the core of the problem varies for different nations. That is, whether the actual drug consumption, trafficking or other aspects of the problem generate the most societal harm (Babor, Caulkins et al., 2010; Babor, Room et al., 2010). In spite of some globally common trends each society has its own characteristics regarding the drug problem. In this section the problem will be discussed with respect to Iceland. That is, the extent of drug use, social characteristics of users, societal attitudes and response to the problem.

2.1 The extent of drug use in Iceland

It was only around 1970 that drugs were first observed in Iceland. Since then the local media has often discussed increased consumption among young people, massive drug seizures, numerous arrests for smuggling and distribution, and prolonged prison sentences. Drug abuse is not particularly widespread in the Icelandic community, but it is still considerable. The number of individuals caught driving under the influence of illicit drugs has increased considerably over past few years, i.e. a 67% increase between 2012 and 2013 (Gunnlaugsson, 2013).

Heroin has never gained sizable foothold in the Icelandic drug market and it has only occasionally been seized in small doses. For example, only 1 gram of heroin was seized by the police and customs office in the year 2013 and before that it was last seized in 2007 in the amount of 12 grams. Cannabis is by far the most common drug in Iceland, next is amphetamine and then cocaine (Ríkislögreglustjórinn, 2014). According to a health directorate study from 2012 more than every forth individual who had tried other drugs than cannabis had used them in the past 12 months (Embætti landlæknis, 2013). Figure 1 shows the proportion of Icelandic people who have tried or consumed each type of illicit drugs according to the health directorate study.

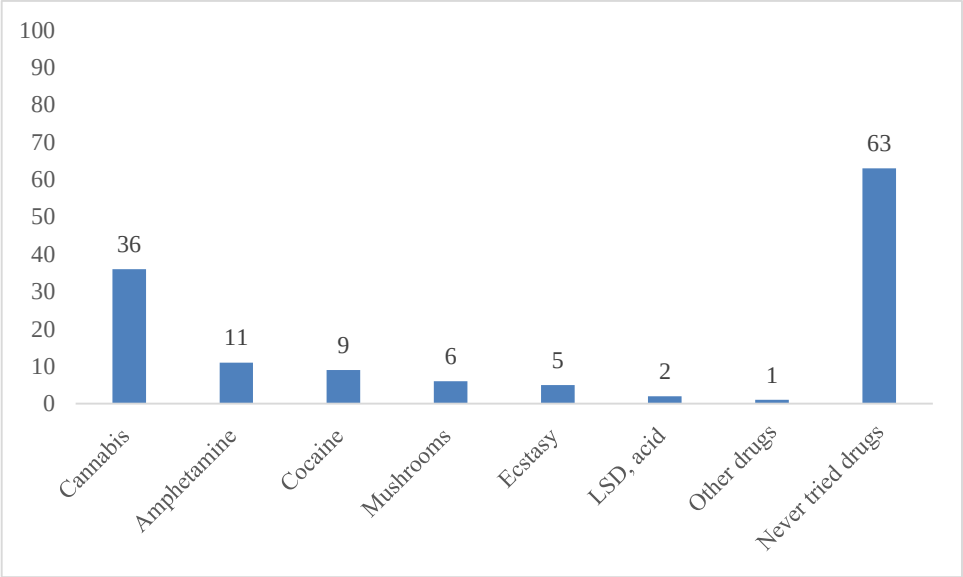

Figure 1. Illicit drug consumption among Icelanders aged 18-67 years. Source: Embætti landlæknis, 2013

The use of cannabis, the most frequently used drug in Iceland, is regularly measured among young students. However, not much is known about how that consumption develops into adulthood. Because cannabis use among adults is less examined little is known about whether consumption starting at young age is constant, increasing or decreasing (Gunnlaugsson, 2013). Studies have shown that cannabis consumption in Iceland is concentrated within younger age groups which causes some concern. Regular use of this particular substance is however negligible among adults which indicates the consumption to be temporary and experimental (Gunnlaugsson, 2013).

In 2013 approximately 23-30% of the Icelandic population claimed to have tried cannabis, depending on the sample (Embætti landlæknis, 2013; Gunnlaugsson, 2013). Less than 10% claimed to have tried it more than 10 times, and nearly 3% to have tried it in the last six months. Cannabis consumption appears more common among men than women as 28% of Icelandic men have tried it compared to 19% of women. Furthermore, 11% of men had tried it more than 10 times compared to only 5% of women, and 4% of men had used it in the last six months compared to 1% of women (Gunnlaugsson, 2013). These results may possibly underestimate the extent of drug use in the Icelandic society, but they still give an idea about the magnitude and properties of the consumption. Even though cannabis use is not particularly widespread in the society the number of Icelanders who have tried cannabis has been increasing in recent years, for example compared to similar statistics from 2002. Over

19% of adult Icelanders (aged 18-74) claimed to have tried cannabis in 2002, only 6% admitted to have tried it more than 10 times, and about 2% to have used it in the last six months. Same statistics from 1997 are nearly the same as in 2002 which indicates that the increase in cannabis consumption is recent (Gunnlaugsson, 2008, 2013). Figure 2 shows the distribution of cannabis consumption by different age groups in Iceland. The figure shows the concentration in the younger age groups, especially when it comes to more regular cannabis consumption which again indicates a more active consumption among the younger generations (Gunnlaugsson, 2013).

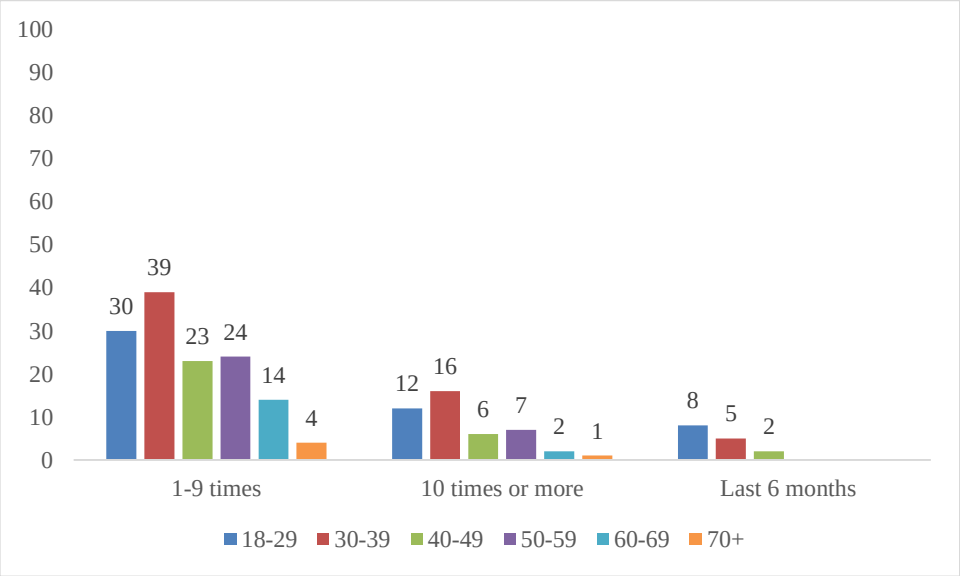

Figure 2. The percentage of Icelandic adults who had tried cannabis in 2013 by age group. Source: Gunnlaugsson, 2013.

A health directorate study from 2102 estimated that around 6% of adult Icelandic people have experienced alcohol or drug addiction sometime in their lifetime (Gudlaugsson, Magnusson and Jonsson, 2014). Of those who sought help at Vogur in 2009 (the most active treatment institution in Iceland) 40% sought help due to alcohol addiction, 20% due to a mix of alcohol and other drugs, 17% due to cannabis, 12% due to amphetamine, and 3% due to cocaine. The share of patients with alcohol problems has been decreasing steadily, in 1995 67% of patients were struggling with alcohol addiction. Most radical changes have been within the youngest patient group. That is, in 1995 46% of patients younger than twenty were admitted with alcohol problems, but in 2009 this rate was 10%. The proportion of patient who had problems with alcohol mixed with other substances has been quite stable, i.e. 25% in 1995 and 21% in

2009. In 2009 48% of patients under twenty were in treatment for cannabis addiction and 17% for amphetamine compared to 23% and 6% in 1995 (SÁÁ, 2010).

2.2 Social characteristics of users

It is known that the risk of developing substance abuse is greatest in the period of adolescence. Drug dependence problems are however only developed by the minority of those who try illicit drugs. Drug problems are more often than not connected to other severe social problems. Those who have problems with drug dependence are more likely to be young males with family history of substance abuse, violent or criminal behaviour, and mental health problems (Babor, Caulkins et al., 2010; Babor, Room et al., 2010). The social reality of illicit drug consumption in Iceland and its mechanisms are no exception from these general trends.

The results of Gunnlaugsson (2013) indicate that drug consumption in Iceland is negligible when looking at society as a whole and that regular consumption and drug abuse is only a problem among specific marginal groups in society. Illicit drug use in Iceland consists primarily of temporary experimental or sociable consumption of cannabis among young adults. That is, tampering that does not lead to addiction. Regarding the concentration of cannabis consumption among young people it has to be kept in mind that the negative effects of cannabis are more harmful for younger consumers (Gunnlaugsson, 2013; Johns, 2001). This might reinforce the society's concern and the hostility of older generations towards drug use. A large proportion of young people seems ready to try illicit drugs, but most stop using as they grow older. Still some continue using illicit drugs as they grow older but to a much smaller extent, others become active and long term users. Some of the individuals who try cannabis develop abuse of various harder substances, and many times alcohol too (Gunnlaugsson, 2013).

Not much is known about the social characteristics of those who abuse hard drugs, but they seem to be in a weak social position and facing various other problems (Gunnlaugsson, 2013). Arrest reports, both from Iceland and other countries, reflect this social pattern of addicts. Vast majority of arrestees for drug-related offense are either unemployed or unskilled, and more so then the norm of the society. For example, almost half of those arrested by the Icelandic narcotics police in the late 20th century were unemployed at time when the unemployment rate in Iceland was extremely low (Gunnlaugsson, 2013; Gunnlaugsson and

Galliher, 2000). Addicts injecting themselves with illicit drugs are probably those who suffer most from their addiction. An Icelandic study on injection users in rehab in 2013 suggests that these addicts are more likely to have disability, limited work experience, only primary school education, be arrested or charged for crime, suffer from mental illness, have hepatitis or HIV, and suffer from suicidal thoughts (Gunnlaugsson, 2013).

2.3 Icelandic attitude towards drug abuse

Iceland is of course an island rather far away from other countries, it has a small population and the society is relatively homogeneous. Furthermore, the community reacts strongly to any external risk. This can explain why studies indicate that the fear of drugs is greater in Iceland than in other countries. Like elsewhere many of the more serious crimes are committed by individuals high on drugs or because of their drug problem, the same is true for alcohol. The public therefore considers these substances, especially drugs, to be the root of the crime-related problems in Iceland (Gunnlaugsson, 2013). According to all but one surveys on public attitude Icelanders believe drug abuse to be the most serious crime problem in the society. The ratio varies with time, but overall about third to half of the Icelandic nation considers drugs and drug use to be the greatest crime problem in Iceland. Figure 3 shows the distribution of the public opinion towards crime in different survey years.

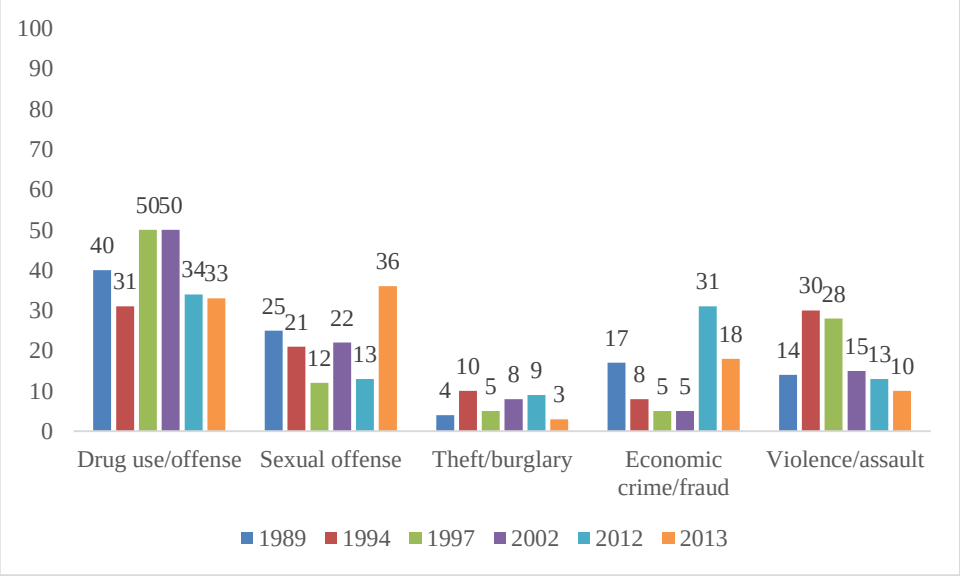

Figure 3. Type of crime considered the most problematic for Iceland. Source: Gunnlaugsson, 2013.

Furthermore, Icelanders consider alcohol and drug use to be the most important drive for criminal behaviour, i.e. why people end up in crime. A strong majority (54-73%) believes that

criminal offense in Iceland is mostly caused by alcohol and drug abuse, and over half consider drug abuse to be a greater social problem than alcohol abuse (Gunnlaugsson, 2013).

According to Figure 3 it was only in 2013 that slightly higher percent of Icelanders considered sexual offense to be a more serious crime problem than drugs. That is, 36% compared to 33% believed it to be the greatest crime problem in Iceland. It is interesting to note that in 2013 the media coverage in Iceland was dominated by discussion of sexual offense where several old and horrid cases were brought to light. Likewise in 2012 economic crime was in the spotlight after the economic crisis in Iceland and in that year 31% of people believed it to be the most serious crime problem. Therefore, the media seems to have great influence on public attitudes, which might indicate the problem to be somewhat exaggerated. However it is hard to identify whether these profound concerns of the public are caused by the media or not (Gunnlaugsson, 2013). The problem surely exist, but the public might be ill informed. Studies have shown that alcohol, a legal substance, can be at least as harmful as illicit drugs if not worse (Babor, Caulkins et al., 2010; Babor, Room et al., 2010; Miller, Levy, Cohen and Cox, 2006; Room, 2006). Still the Icelandic population has much more negative attitudes towards drugs which is plausibly due to how dominating drugs are in the Icelandic underworld. That is, with the rise of the drug market serious or violent crimes have become more common and brutal, crimes that used to be unheard of in the Icelandic society.

Drugs are considered the most serious crime problem in Iceland as well as the most important source of criminal activity. This clearly reflects how seriously the population in general views the presence of drugs in the Icelandic society. The public in general seems to share the concern of authorities regarding the invasion of drugs and therefore supports more extensive interventions aimed at reducing the drug problem. Measures such as authorized house search, phone bugs and monitoring, and information buying by the police to facilitate drug investigation has generally been supported in public attitude surveys (Gunnlaugsson, 2000, 2013). Opposition to the legalization of cannabis, among the public and politicians, has also been substantial according to surveys. The general hostile public attitude towards drugs in Iceland has probably contributed to reducing the spread of drugs in its society (Embætti landlæknis, 2013; Gunnlaugsson, 2013).

2.4 Response to the problem

As previously mentioned, illicit drugs did not appear in Iceland until around 1970. A special narcotics police was established in 1971 and two years later an independent drug court was established. It was clear from the start that authorities intended to respond firmly to this new threat (Gunnlaugsson, 2013; Gunnlaugsson and Galliher, 2000). As discussed in the previous subsections the public in Iceland seems to have worried as much about the drug problem through the years as the authorities. Society members are concerned that the problem will grow and become unmanageable. Even though illicit drug consumption has a relatively small spread in society there seems to be a reason to respond, especially in the case of the most vulnerable drug users. Icelandic authorities, public and media have responded harshly to the drug-problem, which has possibly constrained the spread of illicit drugs even more (Gunnlaugsson, 2013). The most important success factor of Icelandic drug policy might be preventing heroin, which is a particularly harmful drug, from entering the country and gaining foothold in Icelandic drug markets. This is in line with the conclusion of Caulkins and Reuter (2010), and Pollack and Reuter (2014) which claims the main effect of restrictive policies is preventing establishment of new drug markets (discussed further in section 4.1 and 8.2.2.).

Drug-related public interventions in Iceland can broadly be divided into two different categories. Firstly, milder interventions such as school-based prevention, providing information and education, especially aimed at the Icelandic youth. Secondly, tougher and more radical interventions, especially carried out by the criminal justice system (Gunnlaugsson, 2013; Gunnlaugsson and Galliher, 2000). Restrictive policies are most common in Iceland as in other western societies. Import, production, possession, handling, distribution and sale of drugs is punishable by law. The society is considered responsible for protecting public interest (e.g. their health and safety) through strict interventions and prohibition (Gunnlaugsson, 2013). The police and customs have various monitoring at Iceland's ports and boarders, the number of specialized narcotics police officers has increased, and cooperation between public entities has become more persistent (Gunnlaugsson, 2013; Ríkisendurskoðun, 2010). Those smuggling illicit drugs across the Icelandic boarders are most commonly aged 18-22 years and a vast majority of smugglers are male. Number of seizures of amphetamine and ecstasy by the customs control has increased recently while number of seizures of cocaine and cannabis has decreased (Tollstjóri, 2014). When looking at the number of seizures recorded by the national police it can be seen that the

relative distribution of the number of seizures has been quite stable in the most recent years. That is, for 2011-2013 most of the recorded cases are of cannabis, a close second regarding number of seizures is amphetamine, the third is either cocaine, cannabis plants or tobacco mixed cannabis depending on the year (Ríkislögreglustjórinn, 2014). This distribution of seizures is more or less in line with the distribution of illicit drug consumption in Iceland as well as the distribution of treatment patients at Vogur.

Punishment for drug-related crime has been increased and sentences for those crimes have been prolonging as the crimes grow more serious. About one third of prisoners in Iceland are incarcerated for drug-related crime, i.e. for production, import and/or distribution of drugs, but this proportion was less than 10% twenty years ago (Gunnlaugsson, 2011). This proportion does not account for those imprisoned for other offense connected to drug abuse, i.e. theft, burglary and violence related to drugs. Therefore, the drug-related crime problem is more extensive than this proportion of prisoners indicates (Gunnlaugsson, 2013; Ríkisendurskoðun, 2010). Additionally, police interference regarding drug consumption is quite common. Many have police records for possession and acquisition of illicit drugs, mainly cannabis. The national police recorded about 1.500 offenses of this type in the year 2013, which was about 27,7% more instances of possession and acquisition than in 2011 (Gunnlaugsson, 2013; Ríkislögreglustjórinn, 2014). In 2013 offenses for moving illicit drugs between countries were 176, offenses for drug production were 167, and 257 for sale and distribution. In 2013 the total number of offenses recorded by the police was 53.255 (Ríkislögreglustjórinn, 2014).

3 Theoretical arguments for public policy interventions

The total cost borne by the whole society as a result of an action, e.g. production or consumption of a good or service, is the social cost of that particular action. This social cost consists of two other cost concepts, i.e. private cost and external cost. Private cost is the cost borne by those engaging in the action while external cost is the economic cost imposed on unrelated third parties as a result of that action. Social cost of an action is therefore the sum of the private and external costs adjusting for transfers within society (French, Rachal and Hubbard, 1991). The distinction between social cost, external cost and transfers is important (Røgeberg, 2012). Not all actions lead to external costs and in that case private cost is equal to social cost. This is not the case for illicit drug consumption as much of the drug-related cost burden is borne by other members of society. Social cost estimates must therefore include both the private cost borne by the illicit drug consumers and the external cost their drug consumption imposes on others.

The distinction between private and external cost is especially important in policy consideration because it explains differently the reasoning behind estimating these costs (Røgeberg, 2012). In this thesis private cost and external cost are emphasized separately while discussing the social cost imposed on the Icelandic society due to illicit drug use. This separation of the social cost concept is consider more relevant in the following discussion since each of the two provides its own theoretical argument for upholding drug policy. According to economic theory various situations give support for public policy intervention as a tool for increasing welfare in the economy. Economic reasoning generally justifies policy intervention by showing that the intervention, e.g. taxes or regulation, increases the welfare of society members. Public policy intervention based on private cost arguments can be rationalized by looking at the theory of behavioural economics. Support for public policy intervention based on external cost arguments can be rationalized by the more (neo)classical welfare economic theory (Røgeberg, 2007). These separate arguments for policy intervention in drug markets will be discussed in the next two subsections.

3.1 Behavioural arguments related to private cost

From a (neo)classical economic perspective, which has been the most prominent within the discipline, there is a lack of evidence for public policy interventions based on private cost arguments. Policy intervention in the absence of externalities (externalities are discussed in section 3.2) contradicts the traditional understanding of consumer sovereignty and are deemed paternalistic. That is, protecting people from their own bad choices has not been considered an acceptable reasoning for policy intervention (Røgeberg, 2007). One of the core assumptions has been perfect rationality where individuals make the best available choices in each situation (Furubotn og Richter, 2005, pp. 3-12; Røgeberg, 2007). As rational choice has been dominating within economics it has also influenced behavioural economics (see section 3.1.2). Therefore rationality, rational addiction and some of its criticism will be discussed briefly before discussing the behavioural theory that is more accepting of public policy intervention.

3.1.1 Rational addiction theory and its drawbacks

According to rationality the consumer takes long term consumption decisions and incorporates the future in his decision making. This entails that he uses the best available information in a correct way, knows his future preferences and agrees with them, and weighs different periods in a time consistent way. Under these assumptions a rational consumer cannot be better off by public policy intervention because he is never prone to decision failure. Therefore, intervention is only supported when there is harm to others (external costs) which seems rather narrow (Røgeberg, 2007). This assumption has not described actual behaviour well enough historically and it seems more realistic to allow each individual to perceive his surroundings differently, positively and normatively, based on his own experiences (North, 1994). Theory of rational choice and consumer sovereignty does therefore not describe ordinary people well enough. In reality harmful decisions and actions do occur especially for addictive goods such as drugs, tobacco and alcohol (Bernheim and Rangel, 2004; Henden, Melberg and Røgeberg, 2013; Røgeberg, 2007, 2012). According to rationality individuals take into account the risk of becoming dependent and should therefore be allowed to take the involved risks if they choose to do so, how irrational their behaviour may seem (Røgeberg, 2007).

Rational addiction theory can be traced back to Becker who extended consumer theory to sociological phenomena such as sex, marriage, family, divorce, childbirth rate, education, racism, crime and addiction. According to his theories everything can be analysed by looking at net benefit and utility because the same incentives as in classical consumer theory are the driving force behind all individual decision making (Ekelund Jr and Hébert, 2007, pp. 589-600). Addictive behaviour is therefore nothing more than ordinary behaviour which needs no additional or different explanation than consumer theory for non-addictive goods (Buck, Godfrey and Sutton, 1996; Henden et al., 2013). According to rational addiction theory all addiction is due to fully rational choices and therefore all addiction is rational. Well-informed, forward-looking individuals plan their consumption whether it is consumption of tobacco, alcohol, drugs, food, TV, fitness or other goods. Consumers know what choices they will face in the future, know what choices they will want to make and agree with these choices (Becker and Murphy, 1988; Røgeberg, 2007). Becker and Murphy (1988) interpret gradually increasing consumption (dependence) of addictive goods as a rational implementation of the optimal lifetime consumption schedule of that good. According to rational addiction theory there is no reason to prohibit, regulate or prevent consumption of addictive goods such as drugs unless there are negative externalities present (Becker and Murphy, 1988; Buck et al., 1996; Røgeberg, 2007). According to rational addiction theory drug abusers who are unhappy with their consumption would be even unhappier if they were not consuming the good they are addicted to (Becker and Murphy, 1988; Henden et al., 2013). Some view rational addiction theory as a success, but it is quite controversial. It has been criticized for making too strong rationality assumptions for addicts, i.e. assuming them to be capable of responding to incentives while forming a rational long term drug-use plan. This plan is furthermore assumed to take account what consequences their current (and future) drug consumption will have for their future tastes for drug consumption which is rather unrealistic (Melberg and Røgeberg, 2010). Henden et al. (2013) view rational addiction theory as theoretically implausible and empirically false as hesitation and irrationality seem to be a prevalent part of addictive behaviour. Rationality is perhaps more applicable for non-addictive goods, but for addictive goods it completely overlooks real problems faced by addicts such as their experience of inner conflict and lack of self-control. Therefore, the policy-implication of rational addiction theory cannot be taken too seriously (Røgeberg, 2007).

3.1.2 Behavioural economics and addiction

Behavioural economics is a more recent field within economics which has increasingly gained status within the discipline. The theory of behavioural economics modifies the assumptions and expands consumer theory with biological, psychological and philosophical factors. Looking at unhealthy consumption, such as substances, the rationality assumptions of consumer theory have been changed in particular. Alternative assumptions give more space for decision failure and better justify public policy interventions which have often been deemed paternalistic based on a more traditional economic theory. Behavioural economic theory takes into account that decision failure may occur and that the decision maker may need outside help in order to correct for it. The decision failure in question can for example be brought about due to self-control problems. In this situation policy intervention can be desired by the decision maker as a proxy for self-control. That is, the decision maker gets help to control himself while taking the decision which benefits him in the form of increased welfare (Røgeberg, 2007). This argument from behavioural economic theory is very relatable to drug consumption as behaviour can be compulsive where lack of self-control prevents individual decision makers from making choices they consider to be the most valuable course of action. Even though drug consumption is not the result of irresistible or invincible desires it is arguably compulsive in nature, the individual even knows that giving into the compulsive behaviour is a mistake while he is doing it (Henden et al., 2013). As noted by Henden et al. (2013), it is not impossible for addicts to refrain from drugs, but it is much harder for them than non-addicts. For compulsive individuals such as addicts there appears a disparity between the decisions and actions they take. This decision failure is an essential feature of compulsive behaviour as Henden et al. (2013) describe compulsive behavioural patterns as a regular and systematic failures in decision making with respect to actions taken. Therefore, they do not rule out intentional or voluntary addictive behaviour, but they also acknowledge other mechanisms (e.g. psychological, neurological or both) than incentive-sensation as a possible explanation for the compulsive behaviour of addicts. That is, they do not deem all drug-oriented behaviour as rational nor irresistible. Henden et al. (2013) conclude that behaviour can be voluntary, chosen and compulsive at the same time and that intentional effort alone is often insufficient to break out of drug-oriented behaviour patterns.

Research of the philosopher Elster (e.g. 1997) has been influential for the theory of behavioural economics on addictive goods. He described addiction and the strategies people

use to deal with it from various perspectives. One of his focuses was on self-binding, i.e. the behaviour where the individual decision maker tries to comply with a desired action by preventing or constricting future actions or affecting future incentives (Røgeberg, 2007). Elster (1997) criticises rational addiction theory (discussed above) for the lack of attention to such forces that might cause decision failure. Behavioural arguments are strong arguments for regulating and reducing drug consumption for the sake of the actual drug users. As substance abusers, legal or illegal, often desire to quit and even regret ever starting (Nutt, King, Saulsbury and Blakemore, 2007; Røgeberg, 2012). Furthermore, many addicts appear to make conscious efforts to refrain themselves from drug consumption at the same time as they are carrying out drug-oriented behaviour (Henden et al., 2013). This kind of decision failure leads to private costs, explicit and/or implicit, for consumers of addictive goods which they would like to correct, but might be unable to do due to strong dependence or addiction (Røgeberg, 2012). In spite of the behavioural arguments supporting public policy intervention it is more complicated to define the most appropriate way of intervening, this is discussed further in section 8. Even though an intervention is or can be beneficial from a behavioural economic standpoint the issue is more complex. The problem of finding the appropriate policy intervention is not only an economic issue, it is no less political or social in nature so many things have to be considered in such discussion (Røgeberg, 2012).

Røgeberg (2007) points out three different theoretical arguments for why the individual decision maker could fail to take his desired decision. Welfare analysis becomes more demanding by taking these factors into account, but each model or argument provides its own insights to the policy discussion. Each decision failure argument has different implications for policy justification or recommendation as the decision failure in each situation is caused by different factors or underlying decision problems (Røgeberg, 2007). Each argument will be discussed in more detail in the following subsections.

Present bias

Firstly, individuals may be facing present bias which makes them give into temptation (and consume drugs) even though they will regret it later as they know beforehand that they would have preferred to refrain. Their bias towards the present makes them diminish the future regret in the decision process and choose bad consumption now as a result. This type of preference is reflected by hyperbolic or quasi-hyperbolic discounting of the future while traditional

economic theories often assume exponential discounting. With preference bias intertemporal trade off and assessment of future plans is affected by time, i.e. too much significance is put on what is desired in the present relative to the future. As the potential or perceived benefit gets closer in time its significance grows so much that it imbalances the relative benefits between time periods (Røgeberg, 2007, 2012). Within behavioural economics present bias has been used to explain procrastination and other delay of "unpleasant" choices such as dealing with addiction and unhealthy consumption (Frederick, Loewenstein and O'donoghue, 2002; Røgeberg, 2007). Regarding drug abuse the immediate benefits of drug consumption are exaggerated by the individual addict while making the consumption choice, at the same time he is systematically ignoring his longer-run goals or desired behaviour. When the opportunity for drug consumption occurs the estimated value of the consumption has increased so much for the individual decision maker relative to the value of refraining from drugs that his preference has reversed (Buck et al., 1996; Henden et al., 2013). Present bias is in a way an overestimation of present benefit relative to future cost. In behavioural economics it is common to assume that public policy can help individuals to make choices in accordance to their wishes or good intentions for the future, e.g. by taxes on unhealthy consumption or "sin taxes". O'Donoghue and Rabin (2006) make a distinction between those who realize they will deviate from their plans for the future and those who do not and consequently do not account for their weakness. In both cases public policy intervention, such as taxes, can help individuals to improve their welfare. For example in the case of tobacco these individuals can be helped with special taxes to help them live in accordance to their smoking intentions. (O'Donoghue and Rabin, 2006; Røgeberg, 2007, 2012). Even though the individuals are still biased towards the present and put too little emphasis on the future the tax helps compensate for that bias. Theoretically the present bias arguments can also be used to support compulsory treatment of addicts as they would be better off afterwards. Even though it would be politically difficult to implement a policy based on the present bias argument (Røgeberg, 2012) it is still relevant in the theoretical rationalization of drug control.

Unstable preferences or choice capability

Secondly, individuals may be faced with unstable preferences or choice capability. That is, that their taste or preferences are changing unexpectedly and they will not agree with the changes in hindsight. This problems is described by systematic changes with time in the way two given time periods are weighted against each other or compared which causes individuals

to deviate from their plans, i.e. from their desired action (Røgeberg, 2007). That is, there is a contradiction between present and future preferences as the individual is unable to predict the preferences he will use to make future choices. For addictive goods the brain ex ante predicts pleasure from substances and these predicted pleasures are far greater than the pleasures that will actually occur (ex post). Due to this individuals have problems with predicting their own taste changes and often underestimate the magnitude of these changes in preference. Therefore, individuals can be overwhelmed by the urge to do something that does not make any sense (Bernheim and Rangel, 2004; Røgeberg, 2007). This can explain addicts repeatedly and unwantedly engaging in compulsive substance abuse despite knowing the obvious harm and their own desire to refrain from using (Bernheim and Rangel, 2004). In the case of tobacco individuals suffering from this kind of decision failure might be worse off with a special tax on tobacco. In addition to buying excessive amounts of tobacco regardless of the price they also have to pay high taxes. When they buy obsessively anyways the tax does not help them reduce their consumption and correct the problem of unstable preferences or choice capability (Bernheim and Rangel, 2004; Røgeberg, 2007, 2012). In the worst cases the smoker has zero joy or benefit of smoking, but cannot help himself due to the addiction. In this case taxes would only increase his cost burden as he is unable to change his consumption pattern (Røgeberg, 2012).

Social interaction and multiple equilibria

Thirdly, individuals can be faced with social interaction and multiple equilibria. If they are strongly influenced by those around them it can fortify undesired behaviour as norms and traditions. By incorporating social impact in decision making behavioural economics have made possible a situation where there exists a suboptimal (i.e. undesired) equilibria. In this case groups can be locked in situations or equilibria that is undesired. Even if there exists a preferred or better equilibria that everyone would be better off in the group cannot move to the desired equilibria without coordination. Here it is the average behaviour of society or a smaller group that impacts the decision making of each individual. For example, a non-smoker's sensitivity for smoking depends on the extent of smoking in society or his social group (Røgeberg, 2007). In Akerlof's (1997) model individual behaviour is determined by what is perceived as ideal behaviour, and from the behaviour of others in the same social group. Therefore, the entire group can maintain the undesired behaviour (bad equilibria) because no one wants to deviate from the group, even though everyone wants to behave

differently (be in the good equilibria) (Akerlof 1997; Røgeberg, 2007). The bad equilibria can even be so fortified by the social interaction that the group cannot switch equilibria without outside help. In this case public policy can be used to coordinate expectations and behaviour so the better equilibria may be achieved (Røgeberg, 2007).

3.2 Welfare arguments related to external cost

Traditionally it is believed that an individual makes decisions by weighing the costs and benefits this decision will cause himself. External effects or externalities occur when this decision or action also has impact on third parties and the individual does not take that impact into consideration while making the decision (or taking that action) (Røgeberg, 2012). Externalities can be positive or negative, but external cost is generally the result of a negative externality. That is, when this external cost is imposed on nonparticipants the social cost of an activity exceeds the private cost borne by those who engage in the activity. External costs are directly linked to production or consumption of a particular good or service, but the producer or consumer does not account for this cost in his decision making. Therefore, too much of the good is produced or consumed in the sense that it would be socially optimal to reduce the quantity. In this case the regular market forces, supply and demand, fail to maximize welfare for the society as a whole resulting in economic inefficiencies. The socially efficient rate of output can only be generated by also taking external cost into account in the consumption (or production) decision process (Ekelund Jr and Hébert, 2007; Mankiw and Taylor, 2006; Røgeberg, 2007). A widely used example of negative externalities is factory emitting hazardous waste that has adverse effects for the surrounding environment and population.

3.2.1 Coase theorem

Theoretically, many issues related to externalities can be solved through negotiation as explained by the so called Coase theorem. Coase (1960) emphasized mutual or bilateral nature of external effects. That is, that both parties could be responsible for the presence of an externality, but what matters is the property right to cause or avoid the externality in question. Given clearly defined property rights the different parties should be able to negotiate, and buy rights from each other, until the social optimum would be reached (Coase, 1960; Ekelund Jr and Hébert, 2007). In this case, public policy intervention would be unnecessary and not improve the society's welfare. Theoretically, illicit drug consumers could negotiate with other

members of society and pay for the right to abuse drugs until the "optimal" amount of drug abuse would be reached. This absurd example is purely theoretical and it contradicts the discussion of section 3.1.2, i.e. that drug consumers do not necessarily desire the amount of drugs they end up consuming. However, this example helps clarify the theoretical reasoning behind public intervention based on externalities. Without transaction costs public policy intervention could never outperform private negotiation, but as noted by Coase (1960) himself, that situation is only theoretical as transaction costs are inherent in most actions. Furthermore, if transaction costs are high it is costly and difficult for the involved parties to negotiate with each other. High transaction costs outweigh the benefits of the negotiation, and the optimal solution cannot be reached (Coase, 1960; Røgeberg, 2012). In this case welfare in the society could increase as a result of public policy intervention. If the intervention manages to correct for the externality, i.e. incorporate the external cost into the decision making, the society as a whole is better off (Røgeberg, 2012).

3.2.2 Externalities as a rationalization for public policy

As mentioned in the previous section (3.1), neoclassical assumptions in economics assume consumers to be rational, i.e. that they are well informed and take the best choices possible at each time (Furubotn and Richter, 2005, pp. 3-12; Røgeberg, 2007). In this type of world the only rationalization of public policy intervention is external effects. That is, in the presence of external costs the price of particular good is too low, since external costs are not accounted for, and the quantity of that good is higher than socially optimal causing the market failure (Ekelund Jr and Hébert, 2007). In this case the socially efficient rate of output can only be generated by taking external cost into account as well. According to neoclassical economic theory this can be corrected by imposing a special tax on the decision maker in order to make him take responsibility for the negative impact his decision has on the welfare of other society members. This is assumed to restore efficiency, as long as the negative external effects can be quantified they can be incorporated into the price of the good causing the decision maker to choose what is optimal for the whole society (Ekelund Jr and Hébert, 2007; Røgeberg, 2007).

A common policy instrument for correcting consumption-based externalities are taxes. In that case the taxes force the decision maker to take into account the external cost his actions impose on others and efficiency is restored. This type of reasoning has been prominent when it comes to justifying extra taxes on tobacco and alcohol (Røgeberg, 2007). In economics this

type of correcting tax is known as the Pigouvian tax. Theoretically the Pigouvian tax is considered the most efficient way to properly correct for external cost or negative externalities. Given that the value of the external cost is known the tax provides the right incentive to the decision maker to reduce the external cost to the efficient level. That is, the external cost is not necessarily fully eliminated, but it is reduced to the level where the one causing it takes into account all consequences of his decisions (Røgeberg, 2007). This type of public policy instrument is however not feasible when it comes to illicit drugs as public authorities have no direct influence on the price of drugs and cannot collect taxes on illegal consumption. Therefore, other policy instruments have to be considered in order to correct for the negative externalities given by illicit drug consumption.

The policy argument based on external costs is the one that has been the strongest within the economic discipline as well as receiving understanding outside the field (Røgeberg, 2007, 2012). In the case of illicit drug use the externalities are consequences for others which the decision maker, the illicit drug consumer, does not take into account in his decision process, his consumption choice. Theoretically the externalities are identified by all the costs, tangible and intangible, which third parties bear as a result of an action taken by another individual. In this sense purely personal feelings of discomfort could be included in the discussion. These external costs are not only difficult to quantify, but they are arguably insignificant or uninteresting in the analysis (Røgeberg, 2007, 2012). Economic theory does not explain why or how welfare of others is effected through externalities, but it explains how these externalities can be corrected for once they have been identified and quantified (Røgeberg, 2007). Based on that, given correct estimation, the optimal quantity of drugs would be realized. That is, the amount policy makers should aim their policy interventions at achieving. When estimating external cost of illicit drug consumption and discussing the external cost argument for public policy intervention the question of interest is what would the drug consumer himself choose to consume if he would take into account the external cost his consumption puts on other members of society (Røgeberg, 2012). This is expected to differ between drug types as different drugs have different external consequences. Furthermore, many of the external cost of drug consumption is generated in the publicly funded health and legal system, and no tax benefits offset these costs. The net cost-effect of drug consumption is thus expected to be negative, i.e. drugs cost society more than they give to those who benefit. Therefore, given that drugs stay illegal and no taxes can be gained from their consumption, it is expected that the socially optimal amount for the most harmful or socially costly drugs

would be zero. For those drugs, no consumption could even be the optimal case in spite of potential tax revenue due to legalization.

Additional argument for estimating the external cost separately is the focus of this thesis on supply-side drug policy. To evaluate quantity reducing policy response for quantity control it is undoubtedly helpful to have some estimates of the annual external cost of the most common drugs, i.e. cannabis, amphetamine and cocaine. The link, or the causal relationship, between quantity reduction and external cost reduction is however not straightforward. These estimates can still be helpful in speculation regarding potential cost saving and plausible policy emphasis. Moreover, it is other members of the society that fund most of the prevention and policy measures, directly or indirectly. Therefore is it natural to put some focus on cost borne by them, not only the drug users themselves, i.e. the external cost not only the private cost. The private expenditure on drugs by the users is redundant in the analysis as the results are aimed at providing a discussion on public policy (Moore, 2007). That is, public policy intervention is based on preventing cost not taken into account by the decision maker, whether it is private or external. Therefore, the amounts spent on buying drugs is not relevant in the discussion of this thesis. The cost of financing drug consumption is the cost the addicts actually realize and consider in their decision making, and perhaps even the only cost they do consider.

4 Strategies and interventions for controlling drugs

Drug abuse is a common problem in many, if not most, societies who try to keep it at bay or supress it with various tools. These strategies and policy interventions are all part of how society responds to drug problems. Supply-side policy, the sub-focus of this thesis, is only one of the tools of contemporary drug policy. Criminal sanctions, drug interdiction, specialized drug treatment, school-based prevention programs, prescription management programmes and many other are used in the attempt to deal with the adverse effects often related to illicit drug consumption (Babor, Caulkins et al., 2010; Babor, Room et al., 2010). In most democracies prohibition and its enforcement has been the dominant strategy in the fight against drugs and drug-related problems. Where both possession, consumption and distribution of illicit drugs have been punishable by law (Gunnlaugsson, 2002; Pollack and Reuter, 2014). Additionally, sale and distribution of some of the chemicals needed to produce heroin and methamphetamine have been strictly regulated by most nations. One of the policy interventions favoured by authorities has been supply-side enforcement, i.e. policy aimed at producers, sellers and others in the supply-chain for drugs. It is generally assumed that higher prices and less availability of drugs are the results of tougher enforcement (Pollack and Reuter, 2014). These expectations are in line with the economic law of supply and demand (discussed further in subsection 8.2.1).

How the drug problem is defined depends on the nation as the problem is connected to different harms in different societies. That is, for some the consumption is the main problem while for others it is the trafficking that has the worst effect. Where trafficking causes the most harm the problem is mainly a problem for law enforcement (e.g. in Nigeria), but where the use itself is the main issue the problem becomes a matter of social policy (e.g. in Sweden and Iceland). Therefore, it is no wonder that no single drug policy approach is deemed the most appropriate at all times and for all countries (Babor, Caulkins et al., 2010; Babor, Room et al., 2010). Regardless of the limited information on how to prioritize policy, considerable resources are spent on interventions tended to minimize drugs and their harmful effects (Moore, 2007). Babor, Caulkins et al. (2010) identify three broad policy targets and five major drug policy approaches based on their specific aims and broader goals. The broad targets of policy interventions are prevention of drug consumption, services that help heavy

drug users change their behaviour, and supply control policies (incarceration, customs etc.) (Babor, Caulkins et al., 2010; Babor, Room et al., 2010). The drug policy strategies and interventions of Babor, Caulkins et al. (2010) are described in Table 1, each of them has its advantages and disadvantages. Supply control will be discussed further here below as supply-side policy is the sub-focus of this thesis.

Table 1. Drug control strategies and interventions categorized by targeted policy and broader policy goals.

	Policy targets	**Broad policy goals**
Prevention	School-based drug prevention programs, mass media campaigns, reduce access for youth through policing	Change attitudes, improve health literacy, and prevent drug use
Services for drug users	Opiate substitution therapy (methadone and buprenorphine), counselling, therapeutic communities, coerced abstinence through probation/parole supervision, needle exchange programs, peer-support groups	Reduce use, improve health, reduce crime and overdose deaths, prevent spread of human immunodeficiency virus infection, treat psychiatric disorders
Supply control	Arrest traffickers/dealers, force suppliers to operate in inefficient ways	Keep prices high and reduce availability
Prescription regimes	Regulate pharmaceutical companies, pharmacists and physicians	Allow psychoactive substances to be consumed for approved purposes, prevent use for non-approved purposes
Criminal sanctions	Increase penalties for drug possession and use, decrease penalties for some types of drug use (e.g. cannabis)	Deter drug use; prevent normalization and contagious spread of drug use. Prevent negative effects of criminalizing less harmful forms of drug use

Source: Babor, Caulkins et al., 2010; Babor, Room et al., 2010.

4.1 Supply-side policy as a strategic response

Supply-side enforcement involves many types of public policy interventions where each has its own different objective. That is, different supply-side interventions target specific parts of the supply chain for illicit drugs (Pollack and Reuter, 2014). Supply-side policy (supply control) targets production, distribution and sale of illicit substances and controls chemicals used to produce certain drug types. It also involves enforcing law, arrest and incarceration of drug dealers at all levels of the supply chain. The bulk of public spending on drug control is dedicated to supply-side interventions such as these mentioned here (Babor, Caulkins et al., 2010, pp. 139-162; Babor, Room et al., 2010). However, researchers have failed to find strong

empirical evidence to support these interventions. Failure to show an impact on drug supply or drug prices, which should take place according to the law of supply and demand, leads to the conclusion that supply-side control does not give a return in accordance to what is spent on it (Caulkins and Reuter, 2010; Pollack and Reuter, 2014). There are no adequate guidelines for supply-side policy and law enforcement efforts due to lack of data and careful research on the matter. Babor, Caulkins et al. (2010) specify several reasons for this lack of evidence or reasons for why supply-side policy seems to go wrong. Firstly, there is a lack of empirical evidence showing that a global supply-control strategy has a significant effect on drug use in the societies consuming the most. Secondly, there is a lack of consistency in data. Therefore, the impact of strategies such as crop eradication, interdiction, precursor control and other interventions far up the supply chain cannot be estimated accurately. Thirdly, little evidence exists on the return on punishing high-level dealers and returns to extended periods of imprisonment are probably diminishing. Finally, street level enforcement is probably incapable of significantly reducing drug consumption as the number of sellers is too large (Babor, Caulkins et al., 2010, pp. 139-162; Babor, Room et al., 2010). Regarding the last point, supply control at the boarders might be more effective than street level control, especially in preventing new types of illicit drugs from gaining foothold (Caulkins and Reuter, 2010; Pollack and Reuter, 2014). However, in spite of its limited effect on prices and availability, supply-side drug policy can have a significant impact on other crucial factors of the drug problem. That is, it may be fundamental in reducing or controlling harm associated with drug markets (e.g. crime), give dependent users the incentive to get the help and service provided for them, and responding to the moral policy preferences of society in general (or the majority) (Babor, Caulkins et al., 2010, pp. 139-162; Babor, Room et al., 2010).

5 Method and framework

In order to estimate the scope of the social cost generated by illicit drug abuse in Iceland a lot of data is required. Due to distinct characteristics for different societies it is risky to assign foreign results to the Icelandic context. Social structure, culture, legal environment and institutional structure have a great influence on the extent of the social cost of illicit drug abuse. To obtain the social cost estimates used to support the discussion of this thesis the results of an Icelandic study by Matthíasson (2010) have been adjusted to better fit the analysis of this thesis. Matthíasson (2010) estimates the social cost burden generated by alcohol and drug abuse in Iceland on average each year. In order to isolate the cost associated with illicit drug abuse the calculations of Matthíasson (2010) are modified and updated when needed, the resulting estimates are derived and summarized in section 6 and 7. Some cost elements estimated by Matthíasson (2010) are however excluded in this thesis as they are considered to be purely of a fixed nature (e.g. the operation of child protective services), do not support the policy discussion of this thesis (e.g. prevention programs), or are simply too uncertain and would therefore add unnecessary fuzziness (e.g. production loss of imprisonment). Nonetheless, all the major sources of social cost in Matthíasson (2010) are also estimated in section 6. When applicable the most recent information available is used and monetary values are all updated to 2015 prices using the consumer price index calculated by Statistics Iceland. The newest available price index is for April 2015 prices (427) (Hagstofa Íslands, 2015b) while Matthíasson's (2010) calculations are based on September 2009 prices (359). All the estimates in this thesis are presented in April 2015 prices. The majority of estimates in Matthíasson is based on information from the yearly budget in Iceland in 2009. These expenditures are assumed to be mostly unchanged as the purpose here is to estimate the average annual social cost in Iceland in 2015 prices. Amounts from the yearly budget are therefore assumed to hold and are simply updated to 2015 prices. Other numbers which are assumed to be unchanged from those used by Matthíasson (2010) are average number of traffic accidents per year and their severity. Important assumptions of Matthíasson (2010) are assumed to hold as well, these are discussed in the text of section 6, and many of the assumptions in Table 2 are based on this derivation. In order to reflect the current situation in Iceland as well as possible the newest available data is used to isolate the share of illicit drugs in Matthíasson's (2010) results. The 2013 crime statistics of the National Police are used to obtain data on traffic violations (where the driver is under the influence of drugs and/or

alcohol), and data on the number of recorded criminal offenses by genre (Ríkislögreglustjórinn, 2014). Data on patients seeking rehab treatment at Vogur in 2009 is used to represent the addicted population in Iceland (SÁÁ, 2010). Other data being used is drug use estimates from 2012 (Embætti landlæknis, 2013; Gunnlaugsson, 2013), population data from 2015 (Hagstofa Íslands, 2015), and mortality data from 2000-2014 (Hagstofa Íslands, 2014). How this data is used in combination with the data and estimation method of Matthíasson (2010) is discussed in each relevant part of section 6 where the social cost estimates are derived.

5.1 Main assumptions and their influence

There are great uncertainties in the cost estimation process. Uncertainties, especially in parameters, lead to results with some significant uncertainties (Moore, 2007). Assumptions are therefore important in order to account for as much uncertainty as possible. They are necessary in order to identify the social costs involved and to obtain the resulting estimates. Better assumptions give more reliable results. However, assumptions and other simplifications are deterministic for the estimates. That is, different assumptions give different estimates and can be very influential when it comes to sensitivity of results. Therefore, Table 2 gives an overview of the most important assumptions that have to be made and their possible consequences for the estimates of private and external cost of drug consumption in Iceland. Each assumption is discussed further in the relevant subchapters of section 6.

Table 2. Main assumptions and their consequences.

Assumption	Plausible effect
Amounts from the yearly budget are assumed to be unchanged since 2009 (updated w.r.t. price)	Ambiguous or underestimation due to some cuts in public expenditure
Statistical value of life is based on production loss, i.e. estimated according to human capital methods, and assumed to be 96,16 million ISK per life lost due to illicit drug abuse (direct or indirect link)	Underestimation, e.g. willingness to pay methods have generally indicated a much higher value of life
Statistical value of life is based on 3,3% unemployment and 9% disability	Overestimation due to higher unemployment rate in recent years
Share of illicit drug abuse in fatal traffic accidents is assumed to be 24%	Overestimation due to legal drugs
Share of illicit drug abuse in severe and minor traffic accidents is assumed to be 14%	Overestimation due to legal drugs
Traffic accidents where the driver is high are assumed to be completely caused by the intoxication	Overestimation due to outside causes and overlap in police records
Direct violations of drug laws assumed to take up 13% of total police time	Ambiguous
Violations of other laws where the offender is high assumed to take up 16% of total police time	Ambiguous
Violations of traffic laws where the offender is high is assumed to take up 1,3% of total police time	Ambiguous
80% of crime directly or indirectly related to illicit drug abuse would not have happened anyways	Overestimation
Patients at Vogur are assumed to be representative for the substance abuse population in Iceland	Ambiguous
60% of patients at Vogur are assumed to have problems with illicit drug addiction	Overestimation due to legal drugs
The private out-of-pocket share of health care expenditure is assumed to be 20%	Underestimation due to different steps in the private share
19% of illicit drug abusers are hospitalized each year compared to 9,75% of Icelanders in general (9,25% are excess hospitalization due to illicit drug abuse)	Ambiguous
1% of the Icelandic population is assumed to have serious problems with illicit drug abuse, i.e. addiction	Ambiguous
Detoxification and mental health admissions excluded from health care cost	Underestimation
11,7% of Emergency Unit visits assumed to be directly or indirectly connected to illicit drug abuse	Ambiguous
0,89% of annual mortalities are assumed to be directly or indirectly associated with illicit drug abuse	Ambiguous, perhaps overestimation
Negative causal relationship between drug abuse and labour market outcomes is assumed, disability and unemployment are still excluded from the main estimates	Underestimation if the negative relationship holds
Important costs unquantifiable therefore excluded	Underestimation
Supply reduction is assumed to reduce the social cost	Ambiguous

It is important to note that some addicts are active tax payers and not only at the receiving end of social welfare. This should be accounted for when estimating the social external cost of illicit drug abuse. Ideally, to find the external cost or the actual burden borne by third parties the net effect has to be estimated (Røgeberg, 2007). That is, the contribution of the illicit drug abusers in paying for the social expenditure they receive through the health system or the cost they cause in the justice system has to be subtracted from these expenditures. Disregarding this will overestimate the external cost of illicit drug abuse relative to the private cost. Furthermore, the private cost of illicit drug abuse might be exaggerated due to the value of drug consumption. That is, the illicit drug users put some value on their use which should outweigh some proportion of the private cost. The extent of this valuation is out of the scope of this thesis, but aspects such as these matter nonetheless.

5.2 Subdivision of the social cost

French et al. (1991) outline a conceptual framework for estimating the social cost of drug abuse. In this framework social cost is defined as the sum of private cost borne by drug abusers and external cost borne by others. It further separates each type of cost into tangible (objective) and intangible (subjective) cost. Tangible cost is defined as costs requiring actual resources spent by the society. When this type of cost is reduced more resources can be spent differently e.g. on consumption or investment. Intangible cost is mainly defined as pain, suffering and/or discomfort borne by individuals. Reduction of this type of cost will not leave more to spend on other activities, but it will reduce the problem causing the cost (Matthíasson, 2010). Even though intangible costs are difficult and sometimes even impossible to quantify they still matter a lot. For example relevant external costs in health care such as family support and rehabilitation are aimed at reducing this type of cost, i.e. problems causing pain or suffering.

The framework of French et al. (1991) will be used as a guideline in the discussion of the Icelandic cost estimates reviewed in this thesis as it will facilitate identification of different elements of the total social cost. It should however be noted that this categorization is not intended to reflect upon the policy discussion in this thesis, it is only supposed to help categorizing the different aspects of social cost while discussing different cost elements.

The private tangible costs French et al. (1991) deem important to estimate the social cost of drug abuse include for example out-of-pocket medical costs, property damage and incarceration. In their framework external tangible costs are for example the medical cost, crime cost and workplace cost borne by the others in the population. Table 3 gives an overview of the tangible social cost and its cost elements, both borne by the drug users and others in society.

Table 3. Tangible social cost elements related to illicit drug abuse.

Private Tangible Costs	External Tangible Costs
- Out-of-pocket medical-related costs • Hospitization, outpatient, and home Care • **Treatment, rehabilitation, and therapy** • **Counselling, retraining, and re-education** • **Services of health professionals** • **Drugs and drug sundries** • **Household help** • **Special equipment for rehabilitation** • **Transportation to health care providers** **- Reduced earnings** - Incarceration - Property damage due to accidents **- Averting behaviour costs**	**- Non-private medical-related costs** • Hospitization, outpatient, and home Care • Treatment, rehabilitation, and therapy • **Counselling, retraining, and re-education** • **Services of health professionals** • **Drugs and drug sundries** • **Household help** • **Special equipment for rehabilitation** • **Transportation to health care providers** **- Crime-related costs** • Prosecution and courts • Corrections • **Crime careers** • **Property loss** • **Victim losses** - Property damage and injuries due to accidents **- Reduced property values** **- Workplace costs** • Productivity loss • **Workplace accidents** • **Absenteeism** • **Thefts** • **Employee assistance programs** • **Drug testing** **- Reduced leisure time** **- Averting behaviour costs** • Law enforcement • **Educational and public service efforts** • Business and residential security systems • **Community watch programs** • **Business and residential relocations** • **Insurance**

[1] The cost elements estimated or discussed in this thesis are in bold

Source: French et al., 1991.

According to French et al. (1991) intangible private costs are primarily characterized by physical and mental problems such as physical disability, depression, isolation, and anxiety. External intangible cost is also identified to be primarily emotional such as trauma, fear and depression. Table 4 gives an overview of the intangible social cost elements incurred by drug user, but borne both by them and the others in the population.

Table 4. Intangible social cost elements related to illicit drug abuse.

Private Intangible costs	External Intangible costs
- **Physical disability** - Reduced self-esteem - Anxiety - Isolation - Resentment - Family disruptions and conflicts • Divorce • Marital violence • Child abuse - Depression - Emotional distress	- Family Disruptions and conflicts • Separation • Divorce • Marital violence • Child abuse - **Physical Disability** - Fear for personal safety - Fear of property loss - Loss of friendship - Depression - Fatigue - **Emotional distress** - Cost to children of drug abusers • Drug addiction • School problems • Emotional disturbances • Physical health problems

[1] The cost elements (briefly) discussed in this thesis are in bold

Source: French et al., 1991.

6 Social cost of drug abuse in Iceland

In this section the social cost associated with illicit drug abuse is estimated. As previously mentioned, this estimation is based on isolating the social cost of illicit drug abuse from Matthíasson's (2010) estimates. This enables estimating some of the most relevant social cost for supporting the policy discussion of this thesis. Each step is described in the following subsections.

6.1 Traffic accidents

Traffic accidents are one of the sources of social cost generated by drug abuse (Collins and Lapsley, 2002; Moore, 2007). According to the framework of French et al. (1991) traffic accident cost can both be categorized as private and external cost because of the property damage and injuries accidents can lead to, as well as the services required to deal with the consequences of those accidents. Mortalities are an important factor here. In order to properly estimate the social cost of traffic accidents it is important to have some measure for the statistical value of lives lost. Matthíasson's (2010) estimate is based on production loss for the society (human capital method). Premature mortalities are very costly for society as the loss of people in working age creates production loss in current and future periods. Therefore, the value of the lost production has to be discounted. Matthíasson (2010) does so based on data on total income per person (value of production), unemployment rate, employment participation rate, disability rate, Icelandic life expectancy, and the average age of those who die each year directly or indirectly linked to substance abuse. He finds the average number of years left of production based on Icelandic retirement age and with that he derives the average production loss or statistical value of a life, discounted with a 3% discount factor. Matthíasson (2010) uses 3,3% unemployment rate (average unemployment rate in Iceland 1991-2008) and 9% disability rate. The average unemployment rate in Iceland has been higher in recent years, but is slowly lowering again. This will lead to an overestimation of the statistical value of life. Given his assumptions Matthíasson (2010) estimates a statistical value of life equal to 80,85 million ISK per life (September 2009 prices) or 96,16 million ISK in April 2015 prices. As noted by Matthíasson (2010) this does not fully estimate the worth of the lives lost due to intangible factors and higher value of extra life years, i.e. willingness-to-pay methods have

presented much higher values per life. This underestimation will balance out some of the overestimation in Matthíasson's (2010) estimates.

As explained above the social cost estimates are based on a statistical value of life equal to 96,16 million ISK. Matthíasson (2010) estimates social cost due to traffic accidents based on injury cost (or harm to people), cost of services and property damage. Furthermore, he divides cost into two subcategories, i.e. cost borne by those directly involved in the accident and cost borne by third parties. This is approximately the private and external cost of traffic accidents, but not exactly as explained in section 6.1.1. Matthíasson (2010) mentions police and fire department expenditures, medical and ambulance services, and foregone production as examples for the traffic accident cost borne by third parties. Personal injury cost is mainly defined as physical harm based on the statistical value of life and/or subjective injuries. The subjective injuries can both be for the individual involved in the accident and their family, but these costs are mostly intangible and are therefore not included in the estimates of Matthíasson (2010).

Matthíasson (2010) uses the statistical value of life in order to estimate the average harm caused to society and individuals as a result of a traffic accident. Next he predicts the number of injured by severity of accidents from accident registry data. In order to adjust the estimates of Matthíasson (2010) to support the discussion of this thesis accident costs are converted to current prices by using the consumer price index for April 2015. Table 5 gives the estimated the social cost of accidents including injury caused by differently severe traffic accidents. These estimates refer to costs defined by harm to people and other incidental expenses, all the numbers are in million ISK.

Table 5. Social cost generated by different severity of traffic accidents that include injury (million ISK).

Type of accident	***Borne by third parties***	***Borne by directly involved***	***Social cost***
Fatal accident	125,758	17,765	143,523
Severe accident	56,255	45,248	101,502
Minor accident	7,854	8,591	16,445

Source: Matthíasson, 2010.

Matthíasson (2010) considers the social traffic cost of intoxication, i.e. alcohol and drug use of legal and illegal drugs. By using data from the Road Accident Investigation Group he

estimates that 48% of all fatal traffic accidents and 28% of other traffic accidents (in the period 1998-2008) were caused by intoxication. Matthíasson (2010) derives the share of intoxication in fatal accidents based on the average share of fatal accidents where tests showed that the driver had been under the influence. This might still be an overestimation as explained later in this subsection, but it might be balanced out in part because some accident reports do not specify if the driver was intoxicated out of consideration for the family members of the deceased (Matthíasson, 2010). The rates estimated by Matthíasson (2010) are assumed to hold now as well. In this thesis the focus is on illicit drug consumption, therefore these rates have to be split further. Accidents where the driver is intoxicated are very likely to end up in police records as well. The relative share of illicit drugs in driving offenses is therefore assumed to represent this division. According to the 2013 crime statistics of the Icelandic National Police there were 1295 cases recorded where the driver was under the influence of alcohol and 1317 cases of drivers under the influence of drugs. That is, in 50,42% of driver intoxications recorded by the police the driver was on drugs. However, these numbers do not account for overlap, i.e. the situations where the driver was intoxicated by both types of substance. Moreover, where such an overlap is present the accident was a lot more likely to be caused by the alcohol than the drug use because alcohol use increases traffic accident risk relatively more (Babor, Caetano et al., 2010). Therefore, if about half of the drivers are intoxicated by alcohol they would probably cause more than half of the traffic accidents. Therefore, the rate of 50,42% is probably an overestimation of the share of illicit drug use in accidents where the driver is intoxicated. However, it is assumed to hold in order to facilitate the estimation. The sensitivity of the estimates with regard to this assumption will be discussed in section 7.1. Additional overestimation following this rate is that it also includes the use of legal drugs, the police records do not make that distinction.

Furthermore, it is difficult to know precisely to what extent these accidents are due to drug use and to what extent they are due to outside forces, i.e. whether they are only due to drug use or not. The accidents could easily have happened anyway and/or be caused by other factors as well. This is another source of overestimation for the total social cost of traffic accidents caused by illicit drug consumption. That is, assuming that the social cost estimates are caused by the drug use and excluding outside causes from the analysis will overestimate the private and external costs in consideration. However, given the assumptions discussed above the total share of drugs in fatal accidents is estimated to be 24%, and 14% for severe and minor accidents. Based on this the social cost estimates of Matthíasson (2010) are

adjusted with respect to drug use only. The social cost estimates for accidents where people are injured are given in Table 6, in the table traffic accidents are categorized by severity. Given a statistical value of a life equal to 96,16 million ISK and the assumptions discussed above the total accident cost, in accidents including an injury, caused by illicit drug use is 4.497 million ISK on average each year (2015 prices).

Table 6. Social cost of traffic accidents that include injuries and are caused by drug use (million ISK).

Type of accident	*Number of accidents*	*Borne by third parties*	*Borne by directly involved*	*Social cost*
Fatal accident	17,75	540	76	617
Severe accident	141,25	1.122	902	2.024
Minor accident	799,5	886	970	1.856
Total	958,5	2.549	1.948	4.497

[1] Given a 24% share in fatalities and 14% in other accidents as explained in text

[2] These estimates are overestimated due to causal uncertainties and legal drugs as explained in text

Source: Matthíasson, 2010; Ríkislögreglustjórinn, 2014.

Matthíasson (2010) further estimates a 1,789 million ISK property damage per accident resulting from traffic accidents which do not include injuries. These estimates are based on data from insurance companies and the Social Insurance Administration in Iceland, and adjusted for underreporting of personal property damage. Given an annual number of 5.632 traffic accidents, with and without injury, the total property damage cost is 10.075 million ISK (2015 prices). The share of accidents caused by drivers under the influence is assumed to be the same as for severe and minor accidents, i.e. 14%. This gives a total property damage of 1.422 million ISK. These results are summarized in Table 7. Combined the results of Table 6 and Table 7 give a total traffic-related social cost of 5.919 million ISK, including negative effects on people (life or health lost), objects (damage to cars), and cost for third parties.

Table 7. Cost of property damage in traffic accidents caused by drug use (million ISK).

Property damage pr. accident	*Number of accidents (incl. accidents without injury)*	*Total property damage (pr. year)*
1,789	5.632	1.422

[1] Given a 14% share in accidents

Source: Matthíasson, 2010.

6.1.1 Private and external part of traffic accident cost

As mentioned before, Matthíasson's (2010) division of cost between third parties and private individuals is not precisely a division between private and external cost. A part of the personal cost in Matthíasson's (2010) estimates is external cost according to the definition of this thesis. That is, some directly involved in the traffic accident are affected by negative externalities of the drug user's decision to drive under the influence. If half of the personal cost and half of property damage can be accounted as private cost and half as external cost the social cost could be separated. That is, with a total traffic accident social cost of 5.919 million ISK the private cost would amount to 1.685 million ISK and external cost to 4.234 million. As previously mentioned, it is important to keep in mind the uncertainties about how many of these accidents are actually caused by the drug abuse and not some other factors.

6.2 Law enforcement, courts and punishment

A considerable fraction of costs of law enforcement, criminal courts and prisons is due to illicit drugs and drug use (Collins and Lapsley, 2002), i.e. can be identified as social costs of drugs. Moore (2007), and Collins and Lapsley (2002) use self-reported criminal activity to reflect the proportion of these costs attributable to drug use. Matthíasson (2010) uses time logs of police work analysed by type of offense and sector; prosecution, crime and punishment; budget expenditure categorized by sector of law enforcement; studies on alcohol and drug consumption of prisoners; studies on the criminal behaviour of those who got treated at Vogur in 2008; and crime statistics from the National Commissioner of Police. To avoid double-counting Matthíasson (2010) does not account for law enforcement cost due to driving under the influence. Where appropriate he accounts for this type of cost, i.e. if the offense comes to criminal court or punishment.

There is a clear association between illicit drugs and criminal activity. That is, majority of arrestees have recently used drugs and most have used illicit drugs sometime in their life (Schulte, Mouzos and Makkai, 2005; Matthíasson, 2010; Moore, 2007). In Goldstein (1985) drugs are causally associated with crime in three different ways. That is crime due to the intoxication of the user, crime due to financing drug use, and systematic crime due to operation of drug markets and drug distribution (Goldstein, 1985; Moore, 2007). Most crimes committed in Iceland are non-violent with a financial motive and committed randomly (Gunnlaugsson, 2000), but recently systematic crime has been surfacing. With respect to

variety in criminal activity, different drugs have different impact. For example, cannabis has been causally connected to income-generating crime but not to violence (Pacula and Kilmer, 2003). Even though the association between drugs and crime is no contradiction it is difficult to pinpoint exactly the crime-related social cost of drug consumption. This is due to uncertainties about causality as well as intangibility (MacCoun, Kilmer and Reuter, 2003; Moore, 2007; Speckart and Anglin, 1986). That is, as discussed in section 2.2, drug abuse is most often connected to other severe social problems which might be the true cause of the criminal behaviour instead of the drug abuse. These social problems could for example be weak or marginal social position, lack of education and skill, violent family background, and mental health problems. Individuals in this group are generally more likely to participate in criminal activity, even in the absence of drug abuse.

Law enforcement

To estimate the social cost of alcohol and drug consumption incurred due to police intervention Matthíasson (2010) analyses police time logs by type of offenses and divides them into three differently weighted categories based on type of crime. He then estimates the average time the police spends on each category. That is,

1. Violations of drug and alcohol law weighted 100% in Matthíasson's (2010) estimates which results in these crimes occupying about 17% of total time spent on police work. In order to isolate the share of illicit drugs from the share of alcohol crime statistics from 2013 are used to estimate the relative share of each type of offense. According to Ríkislögreglustjórinn (2014) the number of offenses connected to drug law violation was 2.183 while the same for alcohol law was 710. This gives illicit drugs a 75,46% share of the total time cost connected to both alcohol and drugs. That is, 75,46% of the 17% estimated by Matthíasson (2010), or approximately 13% of police time.

2. Income generating crime, theft, domestic disturbance, assault, violation of privacy, sexual offense and other type of violent crime weighted 70% because approximately 70% of prisoners have problems with alcohol and/or drug addiction. This results in these crimes occupying about 27% of police time according to the calculations of Matthíasson (2010). These crimes are more indirectly linked to drugs, i.e. they are very often caused by drugs but do not violate drug laws. In order to isolate the share of illicit drugs it is assumed that these criminals have the same addiction distribution as

patients at Vogur (treatment institution), i.e. that 60% of those suffering from addiction are dependent on illicit drugs as discussed in section 2.1. This share is overestimated due to the contribution of legal drugs, the effect of this assumption will be tested in section 7.1 on sensitivity. For income generating crime and theft drug abuse is a more frequent source of crime, but for domestic disturbance, assault, sexual offenses and violence alcohol is known to have more negative effects than the illicit drug types most common in Iceland. In any case, 60% of the 27% estimated by Matthíasson (2010) are attributed to illicit drugs, or approximately 16% of police time.

3. Other traffic offenses weighted 28% as in the traffic cost estimates of Matthíasson (2010) which resulted in a 2,6% share of police time. However, as in Matthíasson (2010), these offenses weight 0% in the cost calculation to prevent double-counting. They are already included in the estimates of section 6.1.

Hence, the Icelandic police spends 29% of its time on drug-related crime. Whether the crime is the cause or effect of illicit drug use does not change this percentage. However, in order to obtain the estimates something has to be assumed about the proportion of drug-related crime that would not occur in the absence of drug use. That is, some of the offenders would be criminals anyways for example because of other social problems or simply character. In order to account for this Matthíasson (2010) puts a lower limit on his estimates that assumes that 80% of the offenders who commit drug-related crime do so only because of their addiction. Matthíasson (2010) bases this limit on a study of the National Institute on Drug abuse which shows that criminal activity of former prisoners reduces significantly once they get rehab (NIDA, 2009). His upper limit is 100% which is very unrealistic, especially given this section's discussion on uncertainties and the Icelandic context where cannabis is the most common drug. Studies have for example shown that criminal behaviour of cannabis-dependent individuals is not explained by their substance abuse, but by their juvenile history of delinquent behaviour (NZPA, 2001). Therefore, assuming that 80% of crime linked to drug abuse is caused by the drug abuse and would not have happened anyways is surely an overestimation. Nonetheless, the 80% limit of Matthíasson (2010) is used for the purpose of this thesis, how this assumption effects the sensitivity of the social cost estimates is tested further in section 7.1. In any case, using the 80% limit of Matthíasson (2010), approximately 23,2% of police time is spent on drug-related crime.

In order to estimate the drug-related cost of law enforcement Matthíasson (2010) analyses data from several District Commissioners' offices in Iceland. He concludes that 58% of operating expenses go directly to law enforcement along with additional 4,2% through administration expenses. Based on the share of police time due to intoxication he estimates the share of district operations which is connected to intoxication. The same method is used in this thesis which gives a 17,7% share. In order to estimate the share of the Public Prosecutor Matthíasson (2010) used data on alcohol and drug addiction of prisoners from 2008 and data on the reason for imprisonment from 2000-2008. He estimated a lower limit of 54%, as before the lower limit is considered more realistic. In order to isolate the share of illicit drugs it would be possible to use the percentage calculated from the crime statistics (75,46%) or from those treated at Vogur (60%). The former would probably overestimate the share of illicit drugs while the latter would probably underestimate it. Hence, the average of the two is used here.

With the information discussed in this subsection the total social cost of law enforcement generated in each sector can be estimated. Table 8 gives the resulting estimates in 2015 prices. The total social cost of law enforcement (excluding traffic offense) is approximately 2.495 million ISK.

Table 8. Drug-related social cost of law enforcement (million ISK).

Law enforcement sector	***Yearly budget dedicated to each***	***Share of illicit drugs***	***Social cost by sector***
National Police	6.809,5	0,232	1.581
District Commissioners	4.869,6	0,177	860
Public Prosecutor	144,4	0,368	53
Total			2.495

[1] Given a 13% share of policy time spent on illicit drug offenses (explained in text)

[2] Given a 16% share of policy time spent on other offenses excl. traffic offenses (explained in text)

[3] Assumed that 80% of drug-related crime is due to drug use (likely overestimated)

Source: Matthíasson, 2010; Ríkislögreglustjórinn, 2014; SÁÁ, 2010.

Criminal courts

In Matthíasson (2010) the share of alcohol and drug use in courts and lawsuits is assumed to be the same as the share in police time, i.e. 35,2% lower limit and 44% upper limit. That is, 23,2% and 29% in this thesis where drugs are isolated. These shares are also given to the cost of official cases in criminal court, public law assistance and victim compensation. Looking at the total number of court cases in 2008 Matthíasson (2010) finds that 17% of District Court cases and 44% of Supreme Court cases are relevant criminal cases. He assumes the share of alcohol and drugs in these cases to be the same as their share in law enforcement (i.e. 23,2% and 29% in this thesis). As before the upper limit (100% of drug-related crime only caused by the drug abuse) is considered excessive so the lower limit is used and the judicial social cost of illicit drug consumption is estimated. The resulting shares and the corresponding judicial social costs are shown in Table 9. According to these estimates illicit drug use generates approximately 256 million ISK in judicial social cost per year (2015 prices).

Table 9. Judicial social cost due to illicit drugs (million ISK).

Type of judicial cost	***Yearly budget***	***Share of illicit drugs***	***Social cost***
Supreme Court	135	0,102	14
District Court	1.274	0,039	50
Official lawsuit cost	489	0,232	114
Public law assistance	256	0,232	59
Victim compensation	83	0,232	19
Total			256

[1] Given the same share as the time share of the police, i.e. 23,2%

[2] 44% of Supreme Court cases relevant criminal cases (thereof 23,2% drug-related)

[3] 17% of District Court cases relevant criminal cases (thereof 23,2% drug-related)

Source: Matthíasson, 2010.

Punishment

The drug-related social cost of punishment is twofold. First is the cost of the actual imprisonment, i.e. operating expenditures of correctional facilities, and second is the social cost of production loss due to imprisonment (Matthíasson, 2010). The latter is more of an indirect consequence of drug use and will not be included in this thesis as it is prone to too many uncertainties. That is, prisons in Iceland have an active production of various goods and those would outweigh a part of the social cost generated by production loss. In order to know whether the net effect is positive or negative unavailable information is needed, and it would add too much fuzziness to make assumptions about this. Therefore, the production loss due to imprisonment will not be included in the estimates, but the share of illicit drugs in the social cost of punishment will be estimated. As previously mentioned Matthíasson (2010) used data on cause of imprisonment and addiction of prisoners to get a lower limit of 54% for the share of alcohol and drug use in the social cost of punishment. Previously in this section this estimate was adjusted to 36,8% for the isolated share of illicit drug consumption. Based on this share and the yearly budget on prison institutions (1.203,5 million ISK) the estimated social cost of punishment is 443 million ISK (2015 prices). These results are summarized in Table 10.

Table 10. Drug-related social cost of punishment (million ISK).

Yearly budget on correctional facilities	*Share of illicit drugs*	*(Direct) social cost of punishment*
1.203,5	0,368	443

Source: Matthíasson, 2010.

6.2.1 Private and external part of legal and crime cost

Important private costs connected to this section is the income loss of prisoners, but this cannot be estimated based on the same arguments as their production loss will not be included in the social cost estimates (discussed above). Additionally, being registered as a criminal will make it even harder for prisoners to develop professionally once they are free again. This is an important private cost element excluded from the discussion of this thesis. The social cost discussed in the section above is mainly external, i.e. it is borne by other members of society. However, some part of this is of course private cost too as some illicit drug abusers are active tax payers and contribute to the public funds financing the justice system. Given a 37,30%

income tax level (the tax rate for the lowest of three income steps in Iceland) the private part of the cost estimated in this section would be 165 million ISK and the external part would be 278 million ISK. These approximations can be misleading as illicit drug abusers are generally more likely to be unemployed or disable than others in society. Given the assumptions of Matthíasson (2010) the average disability rate among addicts is 22,2% and the average unemployment rate 5,43% which is surely underestimated according to Gunnlaugsson's (2013) results. These assumptions would translate into 122 million in private cost and 322 million ISK in external cost. According to the assessment of Gunnlaugsson (2013) about unemployment among addicted criminals the private cost would only be about half of what Matthíasson's (2010) assumptions indicate. The division between private and external cost is clearly sensitive to these assumptions. Therefore, the social cost of law enforcement, courts and punishment will not be subdivided further in the main estimates. As the external cost is the larger part in this cost category all the social cost will be counted as external cost at the expense of underestimating the private cost. In any case the social cost is what matters for the discussion of this thesis.

The crime-related external costs discussed in this section are in large part generated by how society and authorities respond to crime, i.e. the control regime. This point will be discussed further in section 8.1.3. However, an important part of these external costs is in fact derived harm of drug abuse. That is, the share of illicit drug use in criminal activity not directly connected to drugs which is all criminal activity except for the actual drug law offenses. This includes for example property damage, price of protection, emotional and physical trauma to the victims of crime, homicide, undesired behavioural safeguards (Collins and Lapsley, 2002; Moore, 2007), and various other external costs induced by drug-related crime. Even though some of these external costs are quite tangible it is still difficult to identify how much is actually resulting from drug-related crime. These costs will not be estimated in this thesis due to the many uncertainties, but they matter nonetheless which leads to an underestimation of the external costs in this category.

6.3 Health

It is known that illicit drug consumption is related to miscellaneous physical and mental health problems that can be long term and complicated to deal with. This translates into multiple visits to different health facilities. Ridolfo and Stevenson (2001), for example,

identified 26 drug-related health conditions, either completely or partly caused by illicit drug consumption. Matthíasson (2010) analysed addiction severity interviews from Vogur in order to evaluate how much more health care is needed by those who abuse alcohol or drugs compared to society in general. That is, the excess health care cost due to addiction. Furthermore, he used data from the National University Hospital of Iceland to estimate frequency and cost of hospitalization, and consequently the average cost of admissions. Each year approximately 19% of the patients at Vogur had been admitted to a hospital while only 9,75% of people in general had been admitted. These rates exclude hospitalization due to detoxification, mental disorders, pregnancy or birth (Matthíasson, 2010). In any case the frequency of hospitalization is much higher for alcohol and drug addicts than for the average Icelandic person. The average rate of excess hospitalization among addicts is therefore the difference between the two, i.e. 9,25%. This excess rate is the source of social cost connected to health care. Matthíasson (2010) estimated the number of alcohol and drug abusers based on a study by the Health Directorate in Iceland and population numbers from Statistics Iceland. With this information he estimates the excess hospital admission for this group. This method will be used in this section to isolate the excess health care cost of illicit drug abusers. That is, according to Icelandic research 1% of the population has addiction problems regarding illicit drug use (Embætti landlæknis, 2013; Gunnlaugsson, 2013; Matthíasson, 2010).

In the beginning of 2015 the population of Iceland was 329.100 (Hagstofa Íslands, 2015a). Given that 1% have illicit drug problems the number of Icelanders with drug problems should amount to 3.291 people. Given a 9,25% excess hospitalization (excluding detoxification, mental disorders, pregnancy and birth) the excess admissions of this group are estimated to be 304 per year. Matthíasson (2010) uses data from the National University Hospital and estimates an average cost per admission of 857.568 ISK (in 2015 prices). This translates into approximately 261 million ISK in social cost of drug-related health care. When looking at the cost generated in the Emergency Unit Matthíasson (2010) estimates an average cost of 40.440 ISK per visit and 94.650 visits per year. The share of visitors under the influence of alcohol or drugs is 51%. However, it is not uncommon that people who do not have addiction problems somehow manage to end up in the Emergency Unit, especially after a night of partying. Therefore, when isolating the share of illicit drugs, alcohol is presumed to be the main cause of these visits, i.e. generate the bulk of the social cost identified by Matthíasson (2010). Therefore, only the 23% share of harder drug addiction among rehab patients at Vogur (SÁÁ, 2010) is assumed to reflect the share of illicit drugs in Emergency room visits, i.e. 23% of the

visits by intoxicated people or 11,7% of total visits. This results in a social cost estimate of 449 million ISK (2015 prices). The results for excess health care cost due to illicit drug use, i.e. the health care social cost of drug use, are summarized in Table 11.

Table 11. Social cost of health care due to illicit drug use (million ISK).

Place of care	*Excess visits pr. year*	*Average cost pr. visit*	*Social cost of health care*
National University Hospital	304	0,858	261
Emergency Unit	11.102	0,04	449
Total			710

[1] Given a 9,25% excess hospitalization by addicts (explained in text)

[2] Given a 11,7% share in visits to the Emergency Unit (explained in text)

[3] Underestimation due to exclusion of detoxification and psychiatric admissions

[4] Underestimation due to exclusion of other health care units

Source: Matthíasson, 2010; SÁÁ, 2010.

Additional social cost related to health services is the cost of rehab treatment. According to Statistics Iceland the average societal expenditure in this category for 2008-2010 was about 930 million ISK (2015 prices) (Hagstofa Íslands, 2011). To estimate the share of illicit drugs in this category they are, as before, given the same share as the percentage of patients at Vogur dealing with drug addiction. This will however slightly overestimate the social cost as legal drugs are a part of this proportion.

Table 12. Social spending on rehabilitation treatment (million ISK).

Spending	*Share of illicit drugs*	*Social cost of treatment*
1.106	0,6	664

[1] Slightly overestimated due to legal drugs

Source: Hagstofa Íslands, 2011; SÁÁ, 2010.

6.3.1 Private and external part of health-related cost

Where social services and hospitals are mainly publicly funded, as in Iceland, the external cost reflected in increased public expenditure can be substantial. The social cost of health care estimated above is by definition mostly external. The drug abuser does neither bear it nor account for it in decision making. Even though social services and hospitals are mainly publicly funded there are always some out-of-pocket medical expenses borne by the addict. The private expenses are the lesser part of medical-related social costs, but they still count and even though the private proportion of the cost generated by these visits is not high it

accumulates. Illicit drug abusers, for example, have to pay a higher proportion of their health care costs than Icelanders on average (Matthíasson, 2010). In 2012 the individual share of total health expenditure was around 20%. The external part was estimated above, i.e. 710 million ISK, which would give a private cost of 178 million ISK. This is most likely underestimated because of the same reasons the external cost is so, and because addicts generally have to bear a greater share of their medical cost than the average. Furthermore, some addicts contribute through tax payments which leads to an underestimation of the private share of social health care cost. Given a 37,3% income tax rate, 5,43% unemployment rate among addicts (surely underestimated, see e.g. Gunnlaugsson, 2013), and 22,2% disability rate among addicts 195 million ISK would be subtracted from the external cost and added to the private cost. However, for the same reasons as discussed in section 6.2.1, the social cost of health care in the main estimates will not be subdivided any further than has already been done (results in Table 13). This does not change the total social cost estimate, but some of the cost that should really be defined as private cost has been transferred to the external cost estimate so the external cost is overestimated at the expense of the private cost.

Table 13. Private and external health care cost (million ISK).

Private cost	*External cost*	*Social cost of health care*
178	710,0	888

[1] Given a 20% private share in total health care cost

[2] Social cost underestimated, external cost overestimated relative to private cost (both explained in text)

As noted by Moore (2007) only including these tangible health costs gives a limited impression of the actual private cost borne by drug users, the loss of health is even more important. He therefore focuses on drug-years lost due to disability and potential years lost due to premature death while estimating the health related social costs induced by drug abuse.

An important source of intangible external cost is the impact on families of addicts. Even though it cannot be estimated here it is important to bear in mind. The external costs generated by individual drug consumption but borne by the family of addicts are miscellaneous. The negative psychological impact close relatives often have to live with as a result of loved one's drug abuse is of great importance in this respect. This impact can for example be in the form of the anger, sorrow, shock, stress, trauma, low self-esteem, distress, anxiety, desperation, guilt, depression, self-blame, insecurity, feelings of responsibility and failure close relatives suffer from. These negative psychological impact and severe stress-

related problems undoubtedly lower the quality of life for close family members of the addict. As strain on close relatives grows, it becomes more likely that they themselves suffer from some sort of psychological harm as a consequence. Furthermore, the constant stress can likewise lead to stress-related physical disease such as stomach and bowel problems, muscle aches and fatigue (SÁÁ, n.d.). Even though close relatives react differently and the extent of how they are effected is different, it can be argued that the impact is never positive.

6.3.2 Mortality

Illicit drug use is directly associated with morbidity and mortality, for example through overdose, other injury, non-communicable physical disease, mental disorders, and infectious disease. In this sense drug use by injection is especially risky (Babor, Caulkins et al., 2010; Babor, Room et al., 2010). Illicit drug use is indirectly associated with morbidity and mortality through externalities, e.g. traffic accidents and homicide. Matthíasson (2010) estimates that 83 deaths are directly or indirectly connected to alcohol or drug abuse in the year 2008. As the statistical value of a life is assumed to be 96,16 million this amounts to a social loss of 7.982 million ISK (2015 prices), this is the human capital or production loss for society (Matthíasson, 2010). However, it can be questionable to adjust these results with respect to illicit drug use. More recent numbers with the same categorization of mortalities are unavailable, and causes of death are somewhat fluctuating. In order to approximate this strong stability assumptions have to be made. Nonetheless, it is important to bear in mind the social cost of increased mortality, both when it comes to private and external cost. Of the 83 mortalities Matthíasson (2010) deemed alcohol and drug related 9 were connected with traffic accidents. These are already accounted for in section 6.1 which results in 74 additional deaths connected with alcohol and drug consumption. In order to isolate the share of illicit drugs it is again assumed that SÁÁ's (2010) 23% share of harder drug addiction among rehab patients reflects the relative share of illicit drugs (as for Emergency visits). This lower bound (compared to 60% in other sections) is more intuitive as harder drugs are more harmful both for health and violence which could lead to mortality (Babor, Caulkins et al., 2010; Babor, Room et al., 2010; Miller et al., 2006; Pacula and Kilmer, 2003; Room, 2006). Therefore about 17 mortalities in Iceland are assumed to be, either directly or indirectly, drug-related each year (excluding traffic accidents). This is 0,89% of the average deaths per year which corresponds to the results of a Canadian research on substance abuse. According to Rehm et al. (2006) 0,78% of all deaths are attributed to illicit drug use, directly or indirectly. This

result is considered relevant for comparison because Canadian alcohol and drug use along with the government's share in welfare is similar to the Icelandic context (Matthíasson, 2010; Rehm et al., 2006). With this information and the estimated statistical value of life the annual social cost of mortality connected to illicit drug abuse is approximately 1.637 million ISK (2015 prices). This is summarized in Table 14.

Table 14. Social cost of mortality associated with illicit drug abuse, excl. traffic accidents (million ISK).

Mortalities	***Statistical value of life***	***Social cost***
17	96,16	1.637

[1] Given a 0,89% share in all mortalities

Source: Hagstofa Íslands, 2014; Matthíasson, 2010; SÁÁ, 2010.

Collins and Lapsley (2002) estimated the health-related social cost of illicit drug consumption, including the factors estimated here above and many more. In their estimates they accounted for the foregone cost ("savings") in these areas due to premature deaths (Collins and Lapsley, 2002; Moore, 2007). Ideally foregone cost should be estimated as well because it matters for pure cost analysis. It can surely seem unethical, but from an economic perspective it matters especially when looking at the external cost (Røgeberg, 2007). As Røgeberg (2007) points out that substance abusers who die because of their addiction lead to production loss for society and a loss of tax income. However, to some extent these deaths also include cost "savings" as the deceased no longer need pension nor extra medical assistance in the future. It is of course not being argued here that mortality of drug users is desirable, this is just a cost effect that needs to be kept in mind. The extent of these "savings" is of course related to the scope of the welfare system (Røgeberg, 2007). This argument relates both to mortality of addicts and the deaths caused to others by addicts (e.g. traffic accident or homicide). This "savings" factor is only partly accounted for in Matthíasson's (2010) statistical value of life. He assumes that each individual's accumulated tax earnings should be sufficient to pay for his pension in retirement, which might be true for mortalities where the individual is not an addict but dies because of the actions of an addict. This is much less likely to hold for the actual addict which could lead to an overestimation of the statistical value of life. However, as mentioned in the beginning of section 6.1, the production loss method is already underestimating the value of life so this simplification by Matthíasson (2010) should not be pivotal for the result. Therefore, the adjusted estimates based on Matthíasson (2010) are considered quite suitable for estimating the social mortality cost.

6.4 Disability and employment

Consumption of illicit drugs can effect drug users' performance in the labour market, i.e. their productivity is reduced, unemployment is higher and they rely more on welfare (Moore, 2007). Dependent drug users in the labour force are more ineffective than they could have been and many of them are out of the labour force because of their addiction. Addicts out of the labour force are foregone labour for the economy which also leads to foregone tax revenue for society, not to mention increased welfare payments. While loss of productivity decreases efficiency it could even reduce economic growth. Matthíasson (2010) estimates the social cost as the excess production loss generated by increased disability and unemployment of alcohol and drug addicts to be 29.878 million ISK (2015 prices). Given a 60% share of drug users as before (based on patients at Vogur) this would translate into 17.927 million ISK excess production loss for illicit drug abuse. This estimate will however not be included in the cost estimate of this thesis. In the process of obtaining his result Matthíasson (2010) makes some very strong assumptions about the development of the unemployment rate and the number of people registered as disable. Those suffering from alcohol or drug problems are three times more likely to receive disability than Icelanders in general, and employment rate among addicts is much lower (Matthíasson, 2010). However, it is difficult to estimate precisely how many would not be receiving disability or be employed in the absence of addiction. Furthermore, as noted by Moore (2007), researchers have not reached any consensus on the causal relationship between illicit drug use and labour market outcomes. Some claim to have found a causal link where drug use has negative effects on labour markets (e.g. DeSimone, 2002; Kaestner, 1994; Van Ours, 2005), while others are inconclusive about the relationship (e.g. MacDonald and Pudney, 2001), or even find a positive link (e.g. Gill and Michaels, 1992; Kaestner, 1991). Based on this Moore (2007) does not include costs related to the labour market in his social cost estimates (he however assumes a negative relationship in his sensitivity analysis). In the Icelandic context a negative relationship is assumed to be more applicable which leads to underestimation of the social cost when this production loss is excluded.

6.4.1 Private and external part of disability and employment cost

Another important aspect in this category is the private cost to illicit drug abusers. That is, the production loss to society and disability is also the income loss of drug abusers. Therefore, it is more relevant to divide this cost into private and external cost. That is, production loss minus the tax would be defined as the private cost of illicit drug consumption (the income loss), while the tax share of the production loss would be defined as external cost (foregone tax revenue). This division is however very unclear because of disability checks and unemployment benefits. That is, publicly funded welfare checks reduce the income loss of the addicts and increase the public expenditure. Therefore, the private cost should be lower and the external cost should be higher. Based on these arguments the social cost of disability and unemployment will not be subdivided further in this exercise.

Additionally, very important private costs in this category are intangible and can therefore not be estimated precisely. First and foremost this relates to the private cost of lost quality of life as disability and often unemployment cause severe harm to people mental health and other factors important for their life-quality. Generally people highly value any extra years avoiding disability or unforeseen death due to disability (Abelson, 2003; Moore, 2007).

7 Summary of social cost estimates

According to the Central Bank of Iceland the average exchange rate in April 2015 was 17,26 ISK for the Norwegian krone and 146,76 ISK for the euro (Seðlabanki Íslands, 2015). That is, approximately 0,058 NOK/ISK and 0,007 EUR/ISK. Appendix 1 overviews the summary table for the social cost estimates according to these exchange rates, as well as the sensitivity tables presented here.

All the estimated social costs are presented in Table 15. These costs are only estimated with respect to the cost elements included and quantified in this thesis. According to these estimates the average annual social cost of illicit drug abuse in Iceland is approximately 12.302 million ISK (2015 prices). The largest factor in this social cost seems to be reflected by the social cost of traffic accidents (including the value of lives lost) and law enforcement. This is in line with the results of Moore (2007) which claim that crime-related social cost (including traffic accidents) generates the greatest burden for society.

Table 15. Average social cost of illicit drug abuse per year (million ISK).

Cost category	*Source of social cost*	*Social cost*	*Total for category*
Traffic accidents	Accidents including injuries	4.497	
	Property damage	1.422	5.919
Law enforcement	National Police	1.581	
	District Commissioners	860	
	Public Prosecutor	53	2.495
Courts	Supreme Court	14	
	District Court	50	
	Official lawsuit cost	114	
	Public law assistance	59	
	Victim compensation	19	256
Punishment	Correctional facilities	443	443
Health and health care	National University Hospital	326	
	Emergency Unit	561	
	Rehabilitation	664	
	Mortality	1.637	3.188
Total			12.302

[1] April 2015 prices

[2] Given the assumptions in this thesis

[3] Average exchange rates in April 2015 were 0,058 NOK/ISK and 0,007 EUR/ISK

Important sources of social cost are clearly missing from the estimates, especially regarding private cost. Therefore, the annual social cost is expected to be even higher as important intangible costs are excluded from the calculations along with less quantifiable social costs. Table 2 in section 5.1 summarizes some of the most important sources of bias in the estimates, i.e. causes of over- and underestimation. These are important to keep in mind while considering the social cost estimates.

7.1 Sensitivity and shortcomings

The estimates obtained in this thesis are merely to support the discussion on policy justification and the case of Iceland. It is still very important to keep in mind that results, such as these, are certainly sensitive to the assumptions of the analysis.

One of the stronger assumptions made in this thesis is about the 60% relative share of drug abusers based on their share of patients at Vogur (rehab institution) (SÁÁ, 2010). This estimate was used to approximate the relative share of drug abusers when looking at people who either struggled with drug and/or alcohol addiction. This share is expected to reflect well the relative share of illicit drug abusers compared to alcoholics. That is, the individuals seeking treatment at Vogur are expected to be representative for the population struggling with addiction and substance abuse. However, as mentioned before, this share also includes the people struggling with drug addiction mixed with alcohol problems. Using this share assumes all the people in this category to have problems with illicit drugs not legal drugs which leads to some overestimation. Therefore, for sensitivity purposes, the lower limit of 40% is assumed to hold, i.e. those struggling with a mix of alcohol and drug problems are assumed to be addicted to legal drugs. The results of this modification are summarized in Table 16.

Table 16. Sensitivity to the relative distribution of illicit drug abusers and alcoholics (million ISK).

Source of cost	*Lower limit*	*Upper limit*
Traffic accidents	5.919	5.919
Law enforcement	2.071	2.495
Courts	209	256
Punishment	378	443
Health care	888	888
Rehabilitation	442	664
Mortality	1.637	1.637
Total social cost	11.543	12.302

[1] April 2015 prices

[2] Lower limit based on a 40% share of illicit drug abusers at Vogur, upper limit based on a 60% share

[3] Average exchange rates in April 2015 were 0,058 NOK/ISK and 0,007 EUR/ISK

The share of illicit drug abuse in driving offences most likely overestimates the share of illicit drug abuse in traffic accidents as discussed in section 6.1. Overlap of alcohol and drug intoxicated drivers, and more risk involving driving under the influence of alcohol are important sources of overestimation. That is, assuming that 50,42% of accidents caused by intoxication are caused by illicit drug abuse can be misleading. Based on other assumptions, discussed in section 6.1, this leads to the assumption that 28% of fatal accidents are caused by drug abuse and 14% of other accidents. This can have a great effect on the social cost estimates for traffic accidents. Table 17 summarizes the social cost of traffic accidents for different shares of illicit drugs in accidents with intoxicated drivers.

Table 17. Sensitivity to the relative share of illicit drugs in traffic accidents that are caused by driver intoxication (million ISK).

	10%	*20%*	*30%*	*40%*	*50,42%*
Total social cost generated by traffic accidents	1.174	2.348	3.522	4.696	5.919

[1] April 2015 prices

[2] Given the assumptions in this thesis

[3] 50% share gives 20% share in fatal accidents, and 14% share in severe and minor traffic accidents (explained in text)

[4] Average exchange rates in April 2015 were 0,058 NOK/ISK and 0,007 EUR/ISK

Additionally, as discussed in section 6.2, the rate of drug-related crime that is actually assumed to be caused by the drug abuse is very influential for the social cost estimates associated with the justice system (law enforcement, courts and punishment). In this thesis Matthíasson's (2010) rate of 80% was used to derive the estimates, i.e. it was assumed that 80% of crimes directly or indirectly linked to drug abuse would not have happened without

the drug abuse. This rate is clearly very high and is expected to lead to an overestimation of justice system social cost. Therefore, it is important to see how changing this rate affects the results. This is summarized in Table 18.

Table 18. Sensitivity to the share of drug-related crime attributed to drug abuse only (million ISK).

	20%	***40%***	***60%***	***80%***	***100%***
Total social cost, upper limit	10.059	10.807	11.554	12.302	13.049
Total social cost, lower limit	9.704	10.317	10.930	11.543	12.157

[1] April 2015 prices

[2] Given the assumptions in this thesis

[3] Lower limit based on a 40% share of illicit drug abusers at Vogur, upper limit based on a 60% share

[4] Average exchange rates in April 2015 were 0,058 NOK/ISK and 0,007 EUR/ISK

Another influential sensitivity factor is the statistical value of life. As discussed in section 6.1 the statistical value of each life used to obtain the estimates is 96,16 million ISK per life lost. Matthíasson (2010) derives this value based on premature deaths directly or indirectly associated with alcohol and drug abuse, and the average years left living. This value, as noted by Matthíasson (2010) is based on production loss to society and is expected to underestimate its true value. Willingness to pay methods evaluate a much higher value for each life and the results have been used to try to correct for this underestimation, but they tend to overestimate the value (Matthíasson, 2010; Moore, 2007). The value of life chosen and the method used to estimate it can therefore be very influential for the result, in particular for the social cost of mortality. Matthíasson's (2010) sensitivity analysis is based on five different statistical values of life which he adjusts based on foreign results and two Icelandic studies. These different values and their implication for mortality cost are summarized in Table 19.

Table 19. Sensitivity to different life values (million ISK).

	96,16	***174,37***	***348,74***	***454,59***	***523,10***
Social cost of mortality	1.637	2.968	5.935	7.737	8.903

[1] April 2015 prices

[2] Given an average of 17 lives lost pr. year, directly or indirectly, associated with illicit drug abuse

[3] Average exchange rates in April 2015 were 0,058 NOK/ISK and 0,007 EUR/ISK

Source: Hagstofa Íslands, 2014; Matthíasson, 2010; SÁÁ, 2010.

As previously mentioned there are significant gaps in the knowledge about the causal link between drug use and some social cost elements, e.g. the causality between drugs and crime,

and drugs and labour market outcomes. Furthermore, researchers do not have access to the information and data required to properly estimate the private and external cost generated by illicit drug abuse (Moore, 2007; Reuter, 1999). With good assumption and sensitivity analysis the cost estimates can still be attainable, but it is important to make everything explicit so readers are aware of how ambiguous or imprecise the estimates can be (Moore, 2007). Another important shortcoming of this exercise, as previously discussed, is that intangible costs are not appropriately taken into account. Furthermore, unintended private cost, which is the base of the behavioural policy justification, is extremely underestimated (e.g. due to lack of data and uncertainty about tax payments).

8 Discussion

The costs discussed and emphasized in this exercise are in no way exhaustive. The cost elements of drug abuse are various and the subject is complex, some costs are difficult to identify or convert into estimates. With that in mind, it is however supposed that the most fundamental aspects of the social cost have already been discussed in this thesis. Furthermore, even though flawed, the estimates obtained give a good sense of the extent of how much drugs are costing the Icelandic society. That is, the estimates give a reasonable idea about how large the social cost of illicit drug abuse actually is. This matters for policy discussion and in figuring out how big of a problem the "drug problem" really is, both for actual drug users and for others. That is how much private cost is borne by users and how much external cost it inflicts upon others, and what characterizes both sources of cost. Each particular drug type influences the costs in a specific manner. Therefore, it can be valuable for general drug policy discussion to look at different drug types separately. Even though the estimates by drug type are subject to many uncertainties they can be informative (Moore, 2007). Therefore, in Appendix 2, an effort is made to estimate the contribution of different illicit drug types to the problem at hand.

A noteworthy aspect of drug use is that it is more often than not interlinked with other complex social problems. The drug abuse itself is therefore merely one of the deterministic factors for the harm it causes. This fact has to be kept in mind in any policy discussion (Babor, Caulkins et al., 2010). It can also be valuable to consider the relative harm of legal and illegal substances. Studies have shown that substances such as tobacco and alcohol can be at least as dangerous as many illicit drugs in terms of health effects, intoxication, toxicity, social harm, dependence and social stigma (Babor, Caulkins et al., 2010; Babor, Room et al., 2010; Miller et al., 2006; Room, 2006). In Western-Europe the health problems generated by these legal substances are much more severe than those generated by illicit substances such as cannabis, cocaine or heroin (Gunnlaugsson, 2002).

8.1 Theoretical arguments and how they apply to Iceland

Assuming that the estimates in section 6 and 7 are a sufficient indicator of the magnitude of the social cost of drug use in Iceland the average annual social cost is 12.302 million ISK (April 2015 prices). According to these estimates the cost arguments for public policy

intervention in Iceland seem to be strong. However, the extent of the problem depends on the benefit too, i.e. how big the policy problem actually is depends on how much the social benefits outweigh the social cost. Presumably, as mentioned before, the social cost of illicit drug abuse is expected to exceed the social benefit of the abuse (e.g. value to users and profit of those involved in drug markets). Therefore, the net effect to society should be negative, i.e. net social cost. To estimate how negative is nevertheless challenging. From an economic perspective it is the relative share of the social cost compared to the benefit that matters most for policy justification, but as discussed in later in section 8.1.3 other viewpoints can also be important. The following subsections discuss the social cost and its implication for policy justification based on the theoretical arguments from section 3 as well as some important control effects that have to be kept in mind.

8.1.1 Justification based on behaviour

Behavioural theory, as discussed in section 3.1, can be used to rationalize or justify policy intervention based on the unaccounted private cost borne by drug users. That is, policy can be a desirable tool aimed at changing addictive behaviour for the addicts' own good (Buck et al., 1996). As discussed in section 3.1.2 not all of this cost is caused by rational decision making of the drug addict. The decision failure can be due to present bias, unstable preferences or choice capability, or social interaction and multiple equilibria. The underlying rationale for the decision failure is deterministic about the policy measures that can be justified based on behavioural theory (Røgeberg, 2007). For example, a common policy instrument for consumption considered unhealthy or bad for the consumer is corrective taxes. This method could help the consumer make his desired consumption decision in the case of present bias or social interaction, but would most likely not improve his welfare in the case of unstable preferences as the taxes would not affect his consumption choice (Bernheim and Rangel, 2004; Røgeberg, 2007). This is of course not possible in the case of illegal drugs as authorities do not collect taxes on them, but it shows the logic behind the theory (and is more relevant for potential legalization discussion). If the addiction itself is causing the decision failure and the irrational choices, i.e. dependence disrupts the decision process which causes the decision maker to take a bad compulsive decision, it is better to put policy emphasis on preventing what triggers this undesired behaviour. For such smokers it might be more helpful to ban advertisement and other stimuli that triggers the need to smoke (Bernheim and Rangel, 2004; Røgeberg, 2007, 2012).

From behavioural economic viewpoint policies that increase the likelihood of self-regulating by the addict should be prioritized. This is quite intuitive as the cause of the drug problem from this perspective is lack of self-control and decision failure. Moreover, this type of policy is more likely to have various implications for different subgroups of users as not all users need the same kind of intervention. Some users have more control over their own consumption while others need much more help to restrain themselves, i.e. under some circumstances and for some drug users the substance use can be considered rational (Røgeberg, 2012). There are significant differences in the social cost generated by drug consumption conditional on whether drug consumers are dependent or non-dependent users (Moore, 2007). Better opportunities for self-control would therefore help those who are more compulsive in their decision making without affecting too much those who make more deliberate choices regarding their drug use. From this viewpoint decreased availability of drugs and their triggering factors is a good focus point for policy (Røgeberg, 2012). Whether it is actually possible to construct and implement an ideal drug policy of the type described here is out of the scope of this thesis and remains an unanswered question in its discussion.

8.1.2 Justification based on negative externalities

Welfare theory on externalities, as discussed in section 3.2, can be used to rationalize or justify policy intervention based on the external cost borne by others in society. That is, in their decision making drug users fail to account for the full social cost of their consumption. This leads to more than the socially optimal drug consumption, i.e. the level of drug use which gives the maximal welfare for society taking into account all possible costs and benefits for the whole society. Without incorporating the externalities into the individual decision making it systematically fails to account for the external costs generated which will cause net harm to society (Ekelund Jr and Hébert, 2007; Røgeberg, 2007). Theoretically this issue can be solved by Coasian bargaining or a Pigouvian tax as discussed in section 3.2. Ideally the Pigouvian tax should be equal to the externality which gives the best way to correct for the negative externality and obtain the optimal social welfare. In fact, one of the most common policy instruments used to correct for consumption-based negative externalities are corrective taxes (Røgeberg, 2007). In the case of drugs other policy instruments have to be discussed as taxes are clearly not a feasible policy intervention for illicit goods.

In the case of Iceland, and the discussion of section 6, the external cost of drug consumption seemed substantial and was assumed to be so in the net effect also. This corresponds to the traditional and most widely accepted economic argument for public policy, i.e. the negative external cost argument discussed in section 3.2.2. Aside from the external cost argument being the strongest one from an economic perspective it has been widely used in the political discussion of drugs and their implications for society (Røgeberg, 2007, 2012). The externality rationale for drug policy requires identifying and quantifying the externalities in order to implement the socially "correct" amount of drug consumption. That is, depending on the magnitude of the external cost some drug use could still occur as long as the social benefit (weakly) exceeds the social cost. This would be expected to differ vastly between drug types depending on how harmful they are (Røgeberg, 2007). Determining this optimal quantity of drug consumption from a welfare economic perspective is out of the scope of this thesis. It would require more detailed cost estimates as well as additional benefit estimation along with estimating the Icelandic demand and supply curves for drugs. Furthermore, there are not only pure economic factors that answer the question of ideal drug consumption. Deciding the desired level of drug consumption for society (zero, small, medium etc.) is also a matter of personal taste and social preferences based on attitudes towards drugs. As discussed in section 2.3, Icelandic attitudes towards drugs are generally very negative.

8.1.3 Effects of the control regime

A substantial part of the external cost of drug consumption is due to the control regime, i.e. the institutional setup and broader political structure of the country. The fact that drugs are illegal generates one of the most significant cost elements of the external cost. That is, prohibition of drugs causes what might be defined as control costs. Therefore, the effort spent on reducing use and availability of drugs also generates costs for society and these cost have to be kept in mind in policy discussion (Babor, Caulkins et al., 2010; Babor, Room et al., 2010). Many of the social cost elements considered in section 6, would not be identified as such for a different control regime. That is, cost related to law enforcement, courts and punishment would not be an issue if drugs were not illegal. A lot of money is spent on drug policies annually and even more is devoted to dealing with the consequences of illicit drugs in society, i.e. the bulk of drug-related spending goes to enforcing drug laws (Moore, 2007). In the case of Iceland social cost of law enforcement (mostly external) is about 26% of the average annual social cost, which can be substantial for high amounts. These external costs

would be “avoided” under a different control regime. It is in no way being argued here that drugs should be legal, but it is important to bear in mind that a great part of the external cost of drugs stems from the fact that they are illegal. Drugs are nonetheless harmful and there are other economic arguments than this “external cost avoiding” that support the claim that drugs should be prohibited, e.g. the behavioural reasons previously discussed in section 3.1.

Of course the extent of the drug problem and what it involves varies between countries, but recently some countries have changed their policy emphasis based on arguments such as these. An example of this is a reduction in criminal penalties for small possession for personal use, but maintaining strong penalties for sale and distribution of hard substances such as heroin and cocaine (Babor, Caulkins et al., 2010; Babor, Room et al., 2010; Gunnlaugsson, 2002, 2013). For this debate external cost estimates per drug type matter as different types obviously generate different costs for society. That is, policy emphasis against cannabis should differ from the one for amphetamine as cannabis is relatively less harmful for society.

Diminishing marginal returns and difficulties in identifying the effects of tougher drug enforcement has caused a debate among researchers about whether drugs should be legalized or not (Babor, Caulkins et al., 2010; Babor, Room et al., 2010; Caulkins and Reuter, 2010; Pollack and Reuter, 2014). As mentioned before, corrective taxes are a common policy instrument for consumption considered unhealthy or bad. Both legal and illegal drugs are a major source of social cost, but legal addictive drugs are likewise a major source of tax revenue (Buck et al., 1996). If illicit drugs were made legal they could be taxed in accordance to the external cost they generate or in order to increase their cost for inducing self-controlling behaviour amongst users (Røgeberg, 2007). In this hypothetical situation this tax revenue would offset some of the social cost generated by drugs and it would depend on their net harm whether they should be completely banned or not.

Another significant part of the external cost of drug consumption is due to the welfare system, i.e. it is borne by the publicly funded health system. In the absence of a social welfare system these costs would not be a part of external costs, but would be reassigned as private costs. The welfare state and the ideas about solidarity it entails creates externalities. That is, the welfare system is supposed to provide social security, reduce risk and differences in quality of life. This produces external costs since a large part of the harm caused by drugs ends up being funded by others in society. For example the health treatment of drugs, disability checks, rehabilitation and more is mostly publicly funded. Therefore, the redistributive features of this

system have to be considered while discussing the social cost of drugs (Røgeberg, 2012). If this system was not present a great part of the social cost discussed in section 6.3 would be defined as private cost instead of external cost.

The effect of the control regime on the external (and private) cost estimates is essential to bear in mind in any policy discussion. It is certainly not being argued here that drugs should be legalized or that the welfare system should be revoked. That discussion is multidimensional, multidisciplinary, and simply out of the scope of this thesis. The cost arguments discussed in this subsection are only one side of the discussion and not the only relevant economic arguments. Even though social cost is a valuable contribution to the discussion this is not only a matter of comparing costs and benefits. Røgeberg (2007) notes that economic reasoning, based on cost-benefit arguments, is presumably too narrow for such big questions. In reality people often support policies that contradict the economic perspective. This is also a matter of what sort of society people want to live in and the general mind-set of that society (Røgeberg, 2007). In a democratic society major policy changes have to be supported by the citizens of that society. Good policy goals have to take account of what people in society care most about and what societal goals they care about pursuing. Society's attitude towards drugs, individual rights and the role of the government is also reflected in drug policy. It is therefore impossible to find a single policy advice or a global prescription to the drug problem, especially regarding the control regime debate considered in this subsection (Babor, Caulkins et al., 2010; Babor, Room et al., 2010; Gunnlaugsson, 2013).

8.2 Relevance for supply-side policy

Considering both the traditional external cost arguments in section 3.2 as well as the behavioural arguments in section 3.1 gives an even stronger case for public policy intervention. In order to properly evaluate the benefit of supply-side policy not only the private and external costs of drug consumption would have to be evaluated, but also the benefits associated with the consumption. Even though it can be assumed that the costs outweigh the benefits, i.e. that there is a net social cost to society, the cost estimates alone are not sufficient for a proper conclusion. Furthermore, the costs and benefits of implementing each type of supply-side policy have to be evaluated which is more or less impossible to do accurately (based on the discussion in the above subsection). Analysing whether supply-side policy should be used as a tool for intervention in addictive drug markets and deciding which

type of supply control to use requires identifying, measuring and valuing all the costs and benefits associated with each alternative. Only then can it be verified whether public policy intervention is appropriate or not based on economic (cost) arguments. For any supply-side policy to be justifiable the reduction in private and external costs it entails must outweigh the loss of benefits following the changed drug consumption (Buck et al., 1996). On the other hand, for a policy intervention to be considered successful it does not mean it eliminates the targeted drug problem. If the policy works it is able to reduce the negative impact and prevalence of drug abuse (Babor, Caulkins et al., 2010; Babor, Room et al., 2010). The topic of policy justification is therefore quite complex.

8.2.1 Regarding the law of supply and demand

Prohibition itself raises prices of illicit drugs substantially. According to supply and demand theory added risk for those who supply drugs should decrease supply, i.e. shift the supply curve upwards. That is, when the risk of drug trade increases for the suppliers their production cost increases which reduces their supply for any given price. Increased risk should therefore result in even higher prices and less availability of illicit drugs according to the law of supply and demand. The risk component controlled by public policy is the risk of arrest, incarceration or imprisonment, and seizure of drugs and assets (Pollack and Reuter, 2014). However, there is little empirical evidence implying that raising the risk of arrest, imprisonment and/or seizure raises prices, neither for the prices at the targeted distribution level nor market prices (Caulkins and Reuter, 2010; Pollack and Reuter, 2014; Babor, Caulkins et al., 2010). The few studies that are available are conceptually and empirically flawed which makes their results quite incomparable (Pollack and Reuter, 2014), but their results have raised questions concerning the marginal benefit of supply-side enforcement policies (as mentioned in section 4.1). In particular, the lack of evidence of a price impact of tougher enforcement makes researchers highly doubt the benefit of strict policy regarding incarceration or imprisonment of drug offenders. This type of supply-side enforcement is very costly for society as well as having limited evidence for it being worth the effort (Caulkins and Reuter, 2010; Pollack and Reuter, 2014). According to Pollack and Reuter (2014) the limited price response of supply-side policy may be due to less flexibility in marginal prices compared to average prices, difficulties in preventing suppliers from finding alternative supply methods, and removing violent suppliers might actually reduce the risk instead of increasing it.

Theoretically, demand-side drug policy interventions would have different impact on drug prices as it is aimed at users instead of drug dealers, producers and importers (Pollack and Reuter, 2014). This type of policy is however not discussed further in this thesis as it is another type of issue than the sub-focus on supply-side policy. As addictive substances have some close substitutes (e.g. other illicit drug types and legal substances) it cannot be assumed that their demand is perfectly inelastic with respect to prices. The demand is however likely to be highly inelastic for some addictive drugs. Therefore, higher prices should decrease consumption for most addicts as the degree of addiction varies between different individuals and subgroups of drug users (Buck et al., 1996). That is, price responses should differ with degree of dependence. Therefore, if supply-side policy is able to achieve the desired price increase for drugs it should also reduce drug consumption in society. However, in some circumstances the result of a policy intervention aimed at raising prices can be counterintuitive. For example when the intervention decreases efficiency in drug markets so buyers experience more difficulties in finding sellers. In this situation the inefficiency leads to reduced demand (shifts the demand curve inwards) which can end up lowering drug prices instead of increasing them with an ambiguous effect on the quantity of drugs consumed. That is, either the intervention does not work or has the opposite effects from its goals (Pollack and Reuter, 2014).

Based on the discussion in this subchapter it can prove difficult to clarify and quantify the benefits of supply-side policy, even though the social cost of drug consumption can be, or already has been, quantified. The challenge is not only methodologically demanding but also subject to various sources of uncertainties. This is however worthy of investigation in order to improve current drug policies. This approach has the potential to enable prioritising in policy making so it aims at the drugs and drug users causing the greatest harm in terms of private and external costs (Moore, 2007).

8.2.2 The case of Iceland

For interpreting the results with respect to supply-side policy it is necessary that reduction in costs is a consequence of reducing the quantity of drugs in circulation (Moore, 2007). This assumption is considered quite impeccable. The relationship between supply-side policy and supply reduction is however not as clear as it might seem at first. Seizing one unit of drugs does not mean a one unit reduction in market supply of that same drug type as discussed in

the above subsection. It has been questioned whether supply-side drug enforcement translates into reduced drug consumption. Caulkins and Reuter (2010) conclude that drug control might matter more for avoiding the formation of a new mass market than suppressing an already established mass market. Therefore, return to intense drug supply policy enforcement may be limited (Caulkins and Reuter, 2010). To support their result Caulkins and Reuter (2010) discuss substantial decline in cocaine and heroin prices in USA despite a massive increase in the risk of incarceration for those dealing with drugs. They explain this paradox by drug markets being out of the long run stable equilibrium. For policy the result of Caulkins and Reuter (2010) can for example be interpreted as suggesting increased emphasis on preventing new drugs from gaining foothold. In this regard, Pollack and Reuter (2014) note that an insignificant amount of the many new drug types developed each decade gain enough popularity to build up a new major market. That is, very few of them actually gain foothold. This is especially relevant for Iceland which has mostly managed to keep heroin, a particularly harmful and socially costly drug, out of the country. Harsh response and supply-side policies can certainly have a great effect in this sense.

In spite of uncertainties about quantity effects of supply-side policy, the social cost estimates can be a meaningful indicator of policy response in terms of cost savings for the society (Moore, 2007). Potential benefits could be evaluated by looking at the social cost estimates. How much the social cost decreases as a result of less drug supply depends on an inverse relationship prone to many uncertainties. However, uncertainty in policy discussion can be reduced by estimating the social cost (as was done in this thesis). That is, potential cost savings can be estimated in respect to supply reduction while it is unknown how to achieve that certain supply reduction (as discussed in the subsection above). This is crucial to bear in mind while assessing and developing illicit drug policy (Moore, 2007). As well is it important to take the social cost estimates, even though they are considered to be an appropriate indicator, with caution and not too literally.

The struggle of reducing drug supply in Iceland occurs on multiple fronts where the police and customs play a major role. On account of Iceland being an island custom control on the border has a significant position in countering illegal import of drugs. As discussed previously, preventive measures taken by the police and customs can result in valuable cost savings for society in the form of reduced social cost. It is noted that custom control at the border is most likely more effective as each gram seized at the border is purer than each gram

already in circulation. Even though policy instruments in the battle against drugs differ in efficacy few can be disregarded. It is most likely the composition of different instruments and their interaction that has the greatest effect in reducing drug abuse. Each theoretical argument discussed in this thesis has different implications for policy as each reflects differently the underlying issues. In order to address these issues in the most efficient way they have to be considered in a broad context. As noted by Røgeberg (2007), considering a mix of regulation and policy could give the most efficient, accurate and politically acceptable way to deal with unwanted or unhealthy consumption such as illicit drug use

Babor, Caulkins et al. (2010) discuss the vast differences in the impact of drugs depending on their class and administration method. These factors matter both for individual and societal outcomes, i.e. both for private and external costs. In this respect consumption of opioids, cocaine and amphetamines is more risky, especially when injected because injection is generally more risky in regard to mortality and other severe health outcomes. Drugs such as cannabis and ecstasy entail less risk based on this criteria in spite of their consumption being considerably more prevalent in most modern societies (Babor, Caulkins et al., 2010; Babor, Room et al., 2010). In this sense characteristics of the users can be as critical in determining costs as the specific drug type. According to Moore's (2007) estimates dependent drug users generate 80% of the total social cost burden in the Australian society. Discussion of policy aimed at reducing dependent users is however outside the topic of the thesis as it relates to demand-sided policy (Moore, 2007). Furthermore, as previously noted, many harmful effects of drug use are associated with the physical and social setting of drug use instead of the inherent attributes of the actual drug (Babor, Caulkins et al., 2010; Babor, Room et al., 2010).

9 Conclusion

The social cost estimates for Iceland are certainly not exhaustive and the assumptions made significantly influence the result. The resulting estimates are nonetheless expected to give important insights into the scope of the problem. That is, the extent of the social cost burden of illicit drug abuse borne by the Icelandic society each year. The social cost estimates are merely a tool for supporting the theoretical analysis of this thesis, i.e. the arguments for policy intervention and the implication for supply-side policy.

Social cost of illicit drug use in Iceland seems substantial, both with respect to private and external cost. Therefore, the theoretical arguments for policy justification, discussed in this thesis, seem relevant for the Icelandic context. The behavioural arguments are particularly relevant for the subpopulation abusing hard drugs as their social situation is often very weak. Even though this group is a relatively small part of the Icelandic population its abuse can cause significant social costs. For most Icelanders who try illicit drugs the consumption is experimental and temporary without serious addiction problems. Since drug abuse is not very widespread the externality arguments, discussed in this thesis, are also relevant for the Icelandic context, especially given an unchanged control system. However, the extent of the problem also depends on the social value of drug use because it is the net social cost that determines how big the policy problem actually is, and what policy measures are fit to respond to it. Another important aspect of any policy discussion is the connection between illicit drug use and other social problems. The problem is clearly complex and public policy interventions have to take this complexity into account as well as possible in order to develop and implement adequate public strategies.

It is important to keep the aggregate drug use under control, especially among young users. Icelandic attitudes towards illicit drug use are generally very negative and the society has responded harshly which has undoubtedly prevented illicit drug abuse from spreading further. Policy interventions in Iceland have been centred on supply-side policy with tough drug enforcement. Even though research indicate a limited return on intense supply-side enforcement the positive effect of such policies cannot be eliminated from the discussion. For Icelandic supply-side policy the greatest success has perhaps been preventing heroin, which is an extremely harmful drug, from gaining a foothold in the Icelandic drug markets.

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Appendix 1: Estimates in other currencies

This is based on the average exchange rate in April 2015 according to the Central Bank of Iceland. That is, 17,26 ISK/NOK and 146,76 ISK/NOK (Seðlabanki Íslands, 2015). The following tables show the main estimates in NOK and EUR as well as the sensitivity tables from section 7.1.

NOK:

Table A1. 1. Summary of estimates, million NOK.

Cost category	*Source of social cost*	*Social cost*	*Total for category*
Traffic accidents	Accidents including injuries	261	
	Property damage	82	343
Law enforcement	National Police	92	
	District Commissioners	50	
	Public Prosecutor	3	145
Courts	Supreme Court	1	
	District Court	3	
	Official lawsuit cost	7	
	Public law assistance	3	
	Victim compensation	1	15
Punishment	Correctional facilities	26	26
Health care	National University Hospital	19	
	Emergency Unit	33	
	Rehabilitation	38	
	Mortality	95	185
Total			713

[1] April 2015 prices

[2] Given the assumptions in this thesis

[3] Average exchange rates in April 2015 were 0,058 NOK/ISK and 0,007 EUR/ISK

Table A1. 2. Sensitivity to the share of illicit drug abusers, million NOK.

Source of cost	*Lower limit*	*Upper limit*
Traffic accidents	343	343
Law enforcement	120	145
Courts	12	15
Punishment	22	26
Health care	51	51
Rehabilitation	26	38
Mortality	95	95
Total social cost	669	713

[1] April 2015 prices

[2] Lower limit based on a 40% share of illicit drug abusers at Vogur, upper limit based on a 60% share

[3] Average exchange rates in April 2015 were 0,058 NOK/ISK and 0,007 EUR/ISK

Table A1. 3. Sensitivity to the share of illicit drugs in driver intoxication, million NOK.

	10%	*20%*	*30%*	*40%*	*50,42%*
Total social cost generated by traffic accidents	68	136	204	272	343

[1] April 2015 prices

[2] Given the assumptions in this thesis

[3] 50% share gives 20% share in fatal accidents, and 14% share in severe and minor traffic accidents (explained in text)

[4] Average exchange rates in April 2015 were 0,058 NOK/ISK and 0,007 EUR/ISK

Table A1. 4. Sensitivity to the share of drug abuse in drug-related crime, million NOK.

	20%	*40%*	*60%*	*80%*	*100%*
Average social cost pr. year, upper limit	583	626	669	713	756
Average social cost pr. year, lower limit	562	598	633	669	704

[1] April 2015 prices

[2] Given the assumptions in this thesis

[3] Lower limit based on a 40% share of illicit drug abusers at Vogur, upper limit based on a 60% share

[4] Average exchange rates in April 2015 were 0,058 NOK/ISK and 0,007 EUR/ISK

Table A1. 5. Sensitivity to value of life, million NOK.

	5,57	*10,10*	*20,20*	*26,34*	*30,31*
Social cost of mortality	95	172	344	448	516

[1] April 2015 prices

[2] Given an average of 17 lives lost pr. year, directly or indirectly, associated with illicit drug abuse

[3] Average exchange rates in April 2015 were 0,058 NOK/ISK and 0,007 EUR/ISK

EUR:

Table A1. 6. Summary of estimates, million EUR.

Cost category	*Source of social cost*	*Social cost*	*Total for category*
Traffic accidents	Accidents including injuries	31	
	Property damage	10	40
Law enforcement	National Police	11	
	District Commissioners	6	
	Public Prosecutor	0,4	17
Courts	Supreme Court	0,1	
	District Court	0,3	
	Official lawsuit cost	0,8	
	Public law assistance	0,4	
	Victim compensation	0,1	2
Punishment	Correctional facilities	3	3
Health care	National University Hospital	2	
	Emergency Unit	4	
	Rehabilitation	5	
	Mortality	11	22
Total			84

[1] April 2015 prices

[2] Given the assumptions in this thesis

[3] Average exchange rates in April 2015 were 0,058 NOK/ISK and 0,007 EUR/ISK

Table A1. 7. Sensitivity to the share of illicit drug abusers, million EUR.

Source of cost	*Lower limit*	*Upper limit*
Traffic accidents	40	40
Law enforcement	14	17
Courts	1	2
Punishment	3	3
Health care	6	6
Rehabilitation	3	5
Mortality	11	11
Total social cost	79	84

[1] April 2015 prices

[2] Lower limit based on a 40% share of illicit drug abusers at Vogur, upper limit based on a 60% share

[3] Average exchange rates in April 2015 were 0,058 NOK/ISK and 0,007 EUR/ISK

Table A1. 8. Sensitivity to the share of illicit drugs in driver intoxication, million EUR.

	10%	*20%*	*30%*	*40%*	*50,42%*
Total social cost generated by traffic accidents	8	16	24	32	40

[1] April 2015 prices

[2] Given the assumptions in this thesis

[3] 50% share gives 20% share in fatal accidents, and 14% share in severe and minor traffic accidents (explained in text)

[4] Average exchange rates in April 2015 were 0,058 NOK/ISK and 0,007 EUR/ISK

Table A1. 9. Sensitivity to the share of drug abuse in drug-related crime, million EUR.

	20%	*40%*	*60%*	*80%*	*100%*
Total social cost, upper limit	69	74	79	84	89
Total social cost, lower limit	66	70	74	79	83

[1] April 2015 prices

[2] Given the assumptions in this thesis

[3] Lower limit based on a 40% share of illicit drug abusers at Vogur, upper limit based on a 60% share

[4] Average exchange rates in April 2015 were 0,058 NOK/ISK and 0,007 EUR/ISK

Table A1. 10. Sensitivity to value of life, million EUR.

	0,66	*1,19*	*2,38*	*3,10*	*3,56*
Social cost of mortality	11	20	40	53	61

[1] April 2015 prices

[2] Given an average of 17 lives lost pr. year, directly or indirectly, associated with illicit drug abuse

[3] Average exchange rates in April 2015 were 0,058 NOK/ISK and 0,007 EUR/ISK

Appendix 2: Social cost per gram of different drug types

Each drug type influences the social costs in a specific manner. Since the sub-focus of the thesis is on implication for supply-side policy it can be informative to estimate, at least roughly, the social cost each consumed gram puts on society. In order for this to be possible the average total drug use taking place in the society each year has to be estimated along with the relative harm of each drug type. Per gram estimates can be helpful for estimating policy response or the potential benefit of supply-side policy. In this appendix the social cost estimates of this thesis will be adapted to social cost per gram of drug type. The estimates are based on strong simplifications and are therefore faulty, but they can still help to speculate further on the previous discussion. One of the main assumption is that the annual quantity of drugs seized by the police or customs in Iceland is 15% of the actual quantity in circulation (i.e. the quantity being consumed). This is based on a European rule of thumb (10-15%) discussed in Matthíasson (2010). The average of confiscated grams in 2007-2013 is used to estimate this. Another assumption is about the relative harm of each drug type compared to the others. This is assumed to be 2,79 for heroin, 1,25 for amphetamine and ecstasy, 1,06 for cocaine and 0,47 for cannabis. This is based on a harm index represented in UNODC's 1997 World Drug Report. In this index the different drug types are weighted by their relative harm to health[1]. This is perhaps too simplified as a particular drug type is expected to have different weights in different subcategories of the estimated social cost. This relative harm is however assumed to hold for illustrational purposes. Crime statistics of Ríkislögreglustjórinn (2014) are used to estimate the grams consumed per year, quantities in ml or pieces are disregarded. This should not affect the estimates too much as relative distribution remains rather stable. The social cost per gram of the most common drug types is derived by the formula:

$$weighted\ grams\ pr.year\ \times benchmark\ harm\ pr.gram\ (x)\ = social\ cost\ pr.year$$

That, is: $x\ \sum harm\ index_i \times total\ quantity\ of\ drug\ type_i = 12.301.791.547,$

x is the benchmark harm pr. gram and after x has been identified it is multiplied with the relative harm of each particular drug type (given by the assumed index). This translates into

[1] The numbers from this index were retrieved from an unpublished Swedish report on benefits of drug control.

estimates for social cost per gram. The average grams confiscated each year by the Icelandic police and customs control, the estimated quantity in circulation based on that, the harm index and the resulting social cost per gram of illicit drug type are summarized in the following table[2].

Table A2. 1. Social cost per gram of illicit drug type, rough estimates (in ISK)

Drug type	*Average seized pr. year (g)*	*Estimated quantity in markets (g)*	*Relative harm rate*	*grams*harm rate*	*Social cost pr. gram*
Cannabis	97.172	647.811	*0,47*	304.471	9.416
Amphetamine	30.390	202.598	*1,25*	253.248	25.043
Cocaine	5.280	35.201	*1,06*	37.313	21.236
Ecstasy	2.277	15.180	*1,25*	18.975	25.043
Heroin	2	12	*2,79*	35	55.895

[1] Based on the assumption that 15% of the yearly drug use is confiscated by the police or customs

[2] Cannabis, marijuana, hash, cannabis leaves and cobs counted together

[3] Cannabis plants and tobacco mixed cannabis excluded

[3] Amphetamine and methamphetamine counted together

[4] Other quantities directly from the 2013 crime statistics

[5] Calculations explained in text

For interpreting these results with respect to supply-side policy it has to be the case that reduction in drug supply will reduce the social cost. Such comparison greatly depends on the factors discussed in section 8 of this thesis. For these calculations to be relevant the main assumption is that social costs can indeed be associated with different types of drugs. Another assumption important for the applicability of these calculations is that a decrease in quantity consumed will decrease the associated social costs (Moore, 2007). According to Moore (2007) this assumption is likely to hold for small changes in quantity consumed of different drug types, but would most likely not hold for larger changes. It is important to keep in mind the caveats of these estimates and the uncertainties about how supply-side policy effects actual drug supply which were discussed thoroughly in section 8 of this thesis. One gram seized by the police or customs does not necessarily translate into a one gram reduction in drug consumption. These estimates can still be a meaningful indicator of potential cost savings of supply reduction while it is unknown how to actually achieve the desired reduction in drug supply.

[2] These estimates are largely in line with the results of the Swedish report.